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Beckman

Operating and Servicing Manual

Electronic Instruments Division

BII No. 015-437146

LOT 1, SERIAL 101-125.
LOT 2, SERIAL 126-225.

MODEL 6401

Programmable Counter–Timer

(PREFIX 500)

Beckman
INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
RICHMOND, CALIFORNIA • 94804

JANUARY 1970

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WARRANTY

Instruments sold by Electronic Instruments Division, Beckman Instruments, Inc., (hereafter called "the Company") are warranted only as stated below.

Subject to the exceptions and upon the conditions specified below, the Company agrees to correct, either by repair, or, at its election, by replacement, any defect of material or workmanship which develops within one year after delivery of the instrument to the original purchaser by the Company or by an authorized representative, provided that investigation and factory inspection by the Company discloses that such defect developed under normal and proper use.

The exceptions and conditions mentioned above are the following:

(a) Some components and accessories by their nature are not intended to, and will not, function one year. If any such component or accessory manufactured by the Company and part of the item sold fails to give reasonable service for a reasonable period of time, the Company will, at its election, replace or repair such component or accessory. What constitutes reasonable service and what constitutes a reasonable period of time shall be determined solely by the Company after the Company is in possession of all the facts concerning operating conditions and other pertinent factors and after such component or accessory has been returned to the Company, transportation prepaid.

(b) All instruments claimed defective must be returned to the Company, transportation charges prepaid.

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(e) The Company expressly disclaims any liability to its customers, dealers, and to users of its products, and to any other person or persons for consequential damages of any kind and from any cause whatsoever arising out of or in any way connected with the manufacture, sale, repair, replacement of, or arising out of or in any way connected with the use of any of its products.

(f) Representations and warranties made by any person, including representatives of the Company, which are inconsistent or in conflict with the terms of this warranty (including but not limited to the limitation of the liability of the Company as set forth above) shall not be binding upon the Company unless reduced to writing and approved by an officer of the Company.

(g) This warranty shall be governed by the laws of the State of California.

Claims for damage in shipment should be filed promptly with the transportation company.

All correspondence concerning the instrument should specify the model and serial number. This information appears on the company nameplate. Any inquiry concerning details of operation, possible modifications, etc., should be addressed to the Sales Department, Electronic Instruments Division of Beckman Instruments, Inc., Richmond, California, 94804.

REPAIR SERVICE

Experienced service personnel and special test equipment are available at any of three Regional Service Centers and the factory to perform any necessary repairs. Every effort will be made to expedite the repair of instruments returned for servicing. To obtain warranty service contact your nearest Beckman Service Office, which will give you the necessary instructions for returning the instrument. Beckman Service Offices now in operation are shown on the bottom of this sheet. Instruments returned for service will be sent to the Beckman Service Office, transportation charges prepaid. The instrument will be returned to the purchaser with transportation charges prepaid.

REGIONAL SERVICE OFFICES

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Beckman Instruments, Inc.
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2400 Harbor Boulevard
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Electronic Instruments Division
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Schiller Park, Illinois 60176

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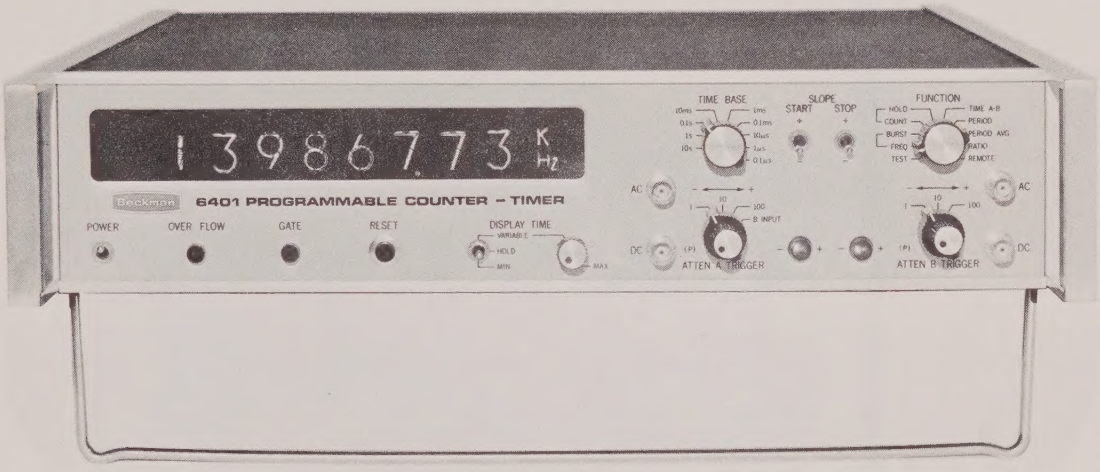
Electronic Instruments Division
U. S. Highway #22 at Summit Road
Mountainside, New Jersey 07091



Model 6401 Programmable Counter-Timer

Frontispiece

MANUAL REVISIONS

Beckman Instruments is continually striving to provide better quality in its products. As a result, changes are initiated to improve performance and specifications.

Several changes may have been incorporated in your instrument since the manual was last printed. If this is the case, may we impose on you to make these changes to your copy of the manual? All changes are given in the form of addenda, one addendum for each change. They are printed on green-colored paper and inserted, in letter or number sequence, immediately following this page. If a change does not apply to your instrument, please disregard the associated addendum.

PREFIX NUMBERS

The prefix number denotes a generation of manuals. All addenda for a certain prefix number are incorporated in the manual before reprinting and the number increased by one (e.g., "Prefix 500" becomes "Prefix 501").

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SECTION 1
GENERAL

INTRODUCTION

The Beckman Model 6401 Programmable Counter and Timer measures frequency, period, multiple period, time interval, and frequency ratio through a frequency range of 0 to 136 MHz. The unit provides eight digits of inline numerical readout with automatically positioned decimal point and legend information. Additional features include remote programming of front-panel controls, BCD storage, BCD outputs, and trigger level monitor lamps. The unit is constructed primarily of integrated circuits, all of which are mounted in sockets for ease of troubleshooting and repair.

The counter will accept a wide range of inputs. Three attenuator positions, AC-DC coupling and trigger level adjustments are provided for both input channels. The individual selection of start and stop slope polarity is provided for time interval and period measurements.

SPECIFICATIONS

Specifications for the Model 6401 are given in Table 1-1.

Table 1-1. Model 6401 Specifications

Input Characteristics (A and B Channels)	Attenuation Factors:	1	10	100
	Sensitivity (rms)	0.1 V	1.0 V	10 V
	Resistance (dc)	1.0 MΩ	1.0 MΩ	1.0 MΩ
	Trigger Level	±1.0 V	±10 V	±100 V
	DC Overload	150 V	500 V	500 V
	DC Blocking	500 V	500 V	500 V
Coupling	AC or DC.			
Input Capacitance	Input resistance shunted by less than 25 pf.			
Trigger Slopes	Positive or negative for start and stop.			
Internal Reference Frequency	10 MHz.			
Time Base Stability	Aging Rate: 1 part in 10^6 per year, or better. Stability Temperature: 20 parts in 10^6 from $0^{\circ}C$ to $50^{\circ}C$. Line Voltage: 1 part in 10^7 for ±10% line voltage change.			

continued. . .

Table 1-1. Model 6401 Specifications - continued

Accuracy	a) Frequency: ±1 count ± oscillator stability. b) Single Period: ±1 count ± oscillator stability ± trigger error. c) Multiple Period: ±1 count ± oscillator stability ± $\frac{\text{trigger error}}{\text{periods averaged}}$. For 0.1 V rms sine wave with a signal-to-noise ratio 40 dB. Trigger error $\leq$ 0.3% of one period.
Display	a) Eight in-line digits are displayed on numerical glow tubes. Display includes automatically-positioned decimal point. The legend displayed is KHz and MHz for frequency measurements, and μs, ms, s, and Ks for time interval measurements. b) Storage On: Display is updated at the completion of a measurement. c) Storage Off: Display follows the counting process.
Display Time (Minimum time between measurements)	Continuously variable from 0.1 to 10 sec. in VARIABLE mode. Nominal 25 μsec. in MIN mode and infinite in HOLD mode.
Coded Output	a) Four-line, 1-2-4-8 BCD output at rear panel (Amphenol 40500, 50-pin connector). Binary 0 is 0 V to +0.5 V, binary 1 is +4 V to +5 V. b) Data is available from buffer storage in all modes except Count or Storage Off in which the data is continuously updated. c) Print command is a logical 1 with a nominal 10 μsec duration.
Auxiliary Inputs	a) External Reference: Accepts external frequencies of 1, 2.5, or 5 MHz as a substitute for internal reference; 1000Ω input resistance. Voltage requirements at each frequency are: 1 MHz - from 0.5 V p-p to 6 V p-p. 2.5 MHz - from 0.5 V p-p to 6 V p-p. 5 MHz - from 0.5 V p-p to 1 V p-p. b) Inhibit: Contact closure to ground or logic 0 which must occur before end of print command. Logic 0 is 0 V to +0.5 V. c) Reset: Contact closure to ground or 0 V to +0.25 V, logic 0. 1 μsec minimum pulse duration.
Auxiliary Outputs	Oscillator Output: 1 MHz sine wave at ≥ 1 V rms from 1000Ω source. Time Base Output: Logic 1 for a duration of 100 ns from a 300Ω source. Logic 0 is 0 V to +0.5 V; logic 1 is +3.5 V to +5 V. Gate Marker Output: A negative pulse, 400 ns ±50% duration at 50% amplitude. Logic 0 is +15 V with a 2.7 K nominal source resistance. Logic 1 is a saturated transistor with 0 to +0.5 V with a load current of 10 mA or less. The gate marker outputs are suitable for intensity modulation of standard laboratory oscilloscopes.

continued. . .

Table 1-1. Model 6401 Specifications - continued

Power	115 V or 230 V (selectable at rear panel). 50 to 60 Hz. 63 Watts maximum.
Temperature	Operating: 0 to +55°C. Storage: -55°C to +75°C.
Weight	20 pounds.
Dimensions	3.5 in high; 17 in. wide; 18.5 in. deep.

THEORY OF OPERATION

A simplified block diagram of the Model 6401 Programmable Counter and Timer is shown in Figure 1-1.

The functional control section is the heart of the system. It takes the program data from the front-panel controls, or the remote program inputs, and produces the logic control signals which route the A channel, B channel, and reference frequency through the system to perform the program. It also produces the logic control signals which select the proper legend and decimal display for the program selected. The routing of the channel input data and the reference frequency is determined by the function selected.

FUNCTIONS

Following is a description of the functions selectable by the front-panel controls or remote program.

TEST Mode

The TEST mode is performed by routing the reference frequency to the time base divider and to the gate. The time base divider divides the reference frequency by 10^0 to 10^8, determined by the front-panel TIME BASE selector switch or remote program. The displayed function is:

10^n counts, where n = 0 to 8 determined by the time base selected.

$$\frac{\text{Input Frequency}}{\text{Reference Frequency}} \times 10^n \text{ counts,}$$

where n is determined by the TIME BASE selector switch or remote program.

The channel output routed to the gate is selected by the A channel attenuator switch on the front panel or by remote program.

FREQ Mode

The FREQ mode is performed in the same manner as the TEST mode, except that the output of the shaper from one of the input channels is routed to the gate in place of the reference frequency. The displayed function is:

$$\frac{\text{Input Frequency}}{\text{Reference Frequency}} \times 10^n \text{ counts,}$$

where n is determined by the TIME BASE selector switch or remote program.

The channel output routed to the gate is selected by the A channel attenuator switch on the front panel or by remote program.

BURST Mode

The BURST mode is performed in the same manner as the FREQ mode with the exception that the time base divider is disabled until the envelope of a carrier frequency is detected on

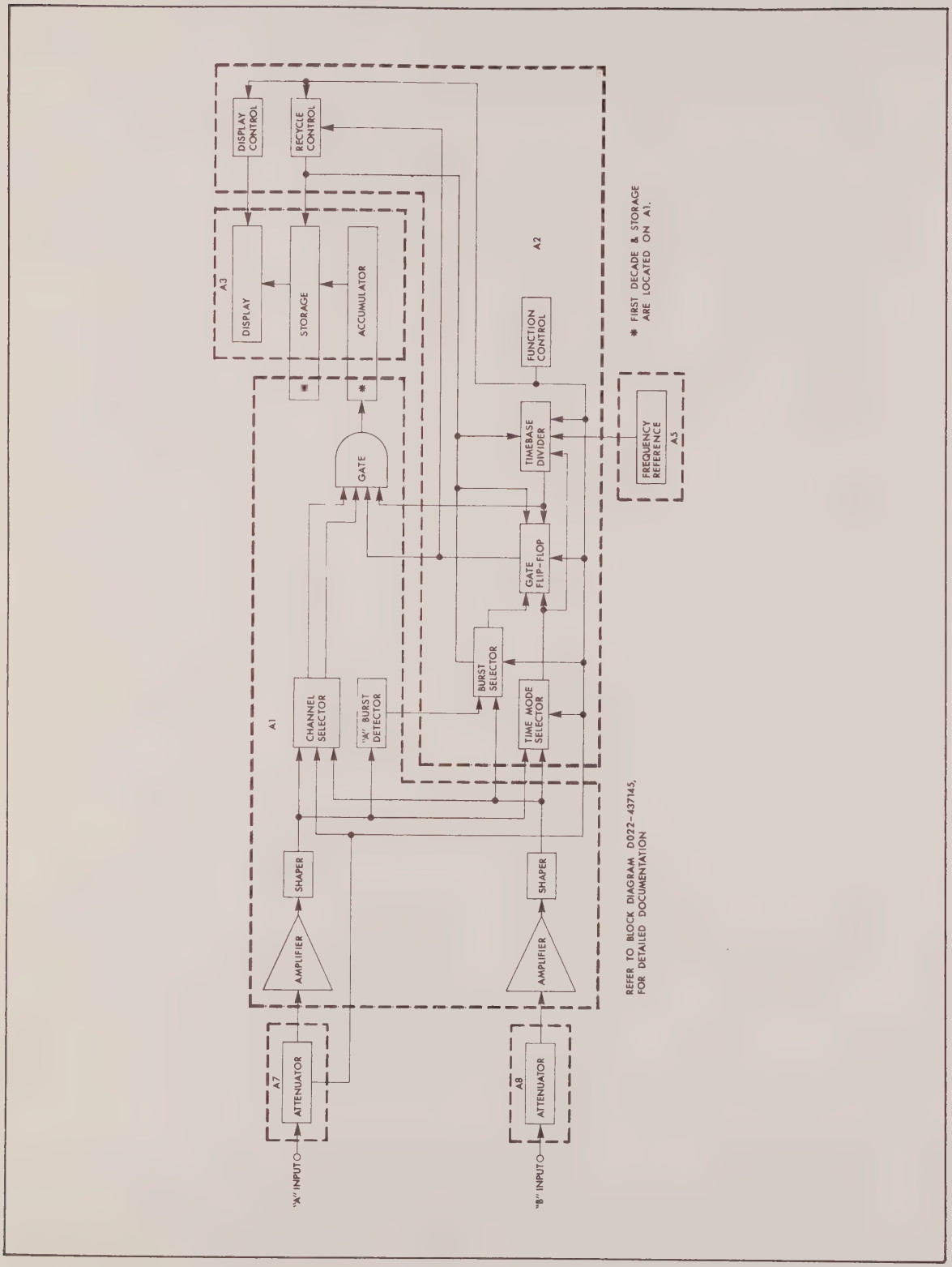

Figure 1-1. Model 6401 Simplified Block Diagram

the selected channel and the Burst control enabled. This synchronizes the gate with the leading edge of a pulse modulated carrier, etc. Channel selection is accomplished with the A channel ATTEN switch or by remote program.

COUNT-HOLD Modes

The COUNT-HOLD functions are used for straight accumulation of events. The storage is disabled, and the shaper from the selected channel is routed to the gate. The gate is controlled by the selection of COUNT or HOLD. A reset is obtained only by manual or remote reset command. Channel selection is accomplished with the A channel ATTEN switch or by remote program.

TIM A→B (Time Interval Measurement)

This mode programs the time mode selector circuits to route the A channel shaper to initiate counting by closing the gate; and the B channel shaper to terminate the counting by opening the gate. The reference frequency is routed to the time base divider where it is divided by 10^0 to 10^8. The output of the time base divider is routed to the gate to be counted for the gate duration. The resolution of the measurement is:

$\frac{10^n}{\text{Reference Frequency}}$ where n is determined by the TIME BASE selector switch or remote program.

PERIOD Mode

This mode is the same as TIM A→B, except that the time mode selector circuits route only the selected input channel to control the gate; i.e., with channel A selected, the channel A shaper will control both the closing and opening of the gate. The input channel is selected by the A channel attenuator switch or remote program.

PERIOD AVG Mode

This function is the same as PERIOD except the resolution is fixed at (Reference Frequency)$^{-1}$, and the gate closing function is routed to the time base divider in addition to the gate flip-flop. The time base divider inhibits the gate opening function until 10^0 to 10^8 gate closing functions have occurred. The factor 0 to 8 is determined by the TIME BASE selector switch or remote program.

RATIO Mode

This mode is a combination of frequency A channel and period average B channel. The A channel shaper output is routed to the gate. The B channel shaper is selected to control the gate as described under "PERIOD AVG Mode". The displayed function is:

$\frac{\text{Frequency Channel A}}{\text{Frequency Channel B}} \times 10^n$

where n is 0 to 8 determined by the TIME BASE selector switch or remote program.

Recycle

The recycle system provides a control over the time between readings and generates the storage and reset commands to recycle the system.

CONNECTORS

Pin numbers for the Digital Recorder connector are given in Table 1-2. Pin numbers for the Remote connector are given in Table 1-3.

Table 1-2. Digital Recorder Connector Pin Numbers

Pin No.	Decimal Digit	Binary Weight	Pin No.	Decimal Digit	Binary Weight	
1	1	1	26	5	4	
2	1	2	27	5	8	
3	1	4	28	6	1	
4	1	8	29	6	2	
5	2	1	30	6	4	
6	2	2	31	6	8	
7	2	4	32	7	1	
8	2	8	33	7	2	
9	3	1	34	7	4	
10	3	2	35	7	8	
11	3	4	36	8	1	
12	3	8	37	8	2	
13	4	1	38	8	4	
14	4	2	39	8	8	
15	4	4	40	8	1	Ninth Digit Option
16	4	8	41	9	2	
17	5	1	42	9	4	
18	5	2	43	9	8	
19	Accessory Command		44			
20	Ground		45			
21			46			
22			47			
23			48			
24			49			
25			50			

Table 1-3. Remote Connector Pin Numbers

UNLESS OTHERWISE NOTED:

Logic LO: -0.5 V to +0.25 V.
Logic HI: +3.5 V to +12 V.
Input Load: 7 DTL gate circuits. (Typical current sink required is 12 mA.)

Pin No.	Selected Mode		Characteristics
5	10 s	TIME BASE	HI: No time base selected.
6	1 s		
7	0.1 s		LO: Any one input LO will select the respective time base. If more than one input is LO, the fastest time base will occur.
8	10 ms		
9	1 ms		
10	0.1 ms		
11	10 μs		
12	1 μs		
13	0.1 μs		

continued. . .

Table 1-3. Remote Connector Pin Numbers - continued

Pin No.	Selected Mode	Characteristics
22 23 24 27 34 35 36	TEST FREQ BURST TIM A→B RATIO PER AVG PERIOD FUNCTION	HI: No function selected. LO: Any one input low will select the respective function. More than one input LO will result in an indeterminate function.
25 26	COUNT HOLD	HI: Counter gate remains in previously selected state. LO: For greater than or equal to 500 ns will switch the gate to the selected state. Selecting both inputs will place the gate in the hold state.
31 32	START STOP SLOPE	HI: Negative slope. LO: Selected slope is positive.
33	B Enable	HI: A input is connected to count chain. LO: A input is not used and B input is connected to count chain.
21	Fast Display	HI: Display time is controlled by front-panel controls of HOLD-VARIABLE-MIN and DISPLAY TIME. (Also, see remote display rate, pins 17 and 18.) LO: Display time fixed at 25 μs nominal.
17 18	Display Rate	Resistance: When the front-panel HOLD-VARIABLE-MIN switch is placed in the HOLD position, the display time can be controlled externally by placing a 500 KΩ variable resistor across pins 17 and 18. When 500 KΩ, display time is 10 seconds nominal. When 0 Ω, display time is 100 ms nominal. If external resistor is applied, it will affect the control range of the front-panel control reducing the 10 s maximum time when not in REMOTE mode.
20	RESET	HI: No effect. LO: For greater than or equal to 1 μs will reset the counter function and data storage. Counter will not be released to take a new count until returned to HI.
19	Ground	Logic Ground: May be used as reference point or source of LO signals, or program return point if program inhibit is not desired.
14	Ground, Remote Function	Output - HI: When front-panel FUNCTION switch is in any position other than REMOTE. LO: When in REMOTE position. Provides remote program inhibit when not in REMOTE mode. Load is a switch to ground for LO and 1KΩ to +5V for HI.
15 16	A B Trigger Level	Analog: Input points for trigger level voltages. A ±15 V dc voltage will vary the trigger level greater than ±1 V x Attenuator setting on the front-panel control. The front panel trigger level control must be in the preset position, otherwise excessive loading will result depending upon the front panel trigger level pot position. Load resistance is 3KΩ when in preset position.

SECTION 2
DIAGRAMS & PARTS LISTS

INTRODUCTION

This section contains diagrams and parts lists pertinent to the Model 6401. Parts lists for individual assemblies are located near or with their respective component layout drawings and schematic diagrams. Table 2-1 lists the drawings and parts lists and their respective page numbers.

Table 2-1. Diagrams and Parts Lists

Description	Dwg. No.	Page
Block Diagram	D-437145-A	2-2
Outline Drawing	C-437151-A	2-3
Input Board Assembly Diagram (A1)	D-437037-B	2-4
Input Board Assembly Parts List		2-5
Input Board Schematic Diagram (A1, A7, A8) Page 1 of 2	D-437036-B	2-7
Input Board Schematic Diagram (A1, A7, A8) Page 2 of 2	D-437036-B	2-8
Function Board Assembly Diagram (A2)	D-437117-B	2-9
Function Board Assembly Parts List		2-10
Function Board Schematic Diagram	E-437118-B	2-11
Count Board Assembly Diagram (A3)	D-437063-C	2-13
Count Board Assembly Parts List		2-14
Count Board Schematic Diagram	D-437062-C	2-15
Regulator Board Assembly Diagram (A4)	D-437096-B	2-16
Regulator Board Assembly Parts List		2-17
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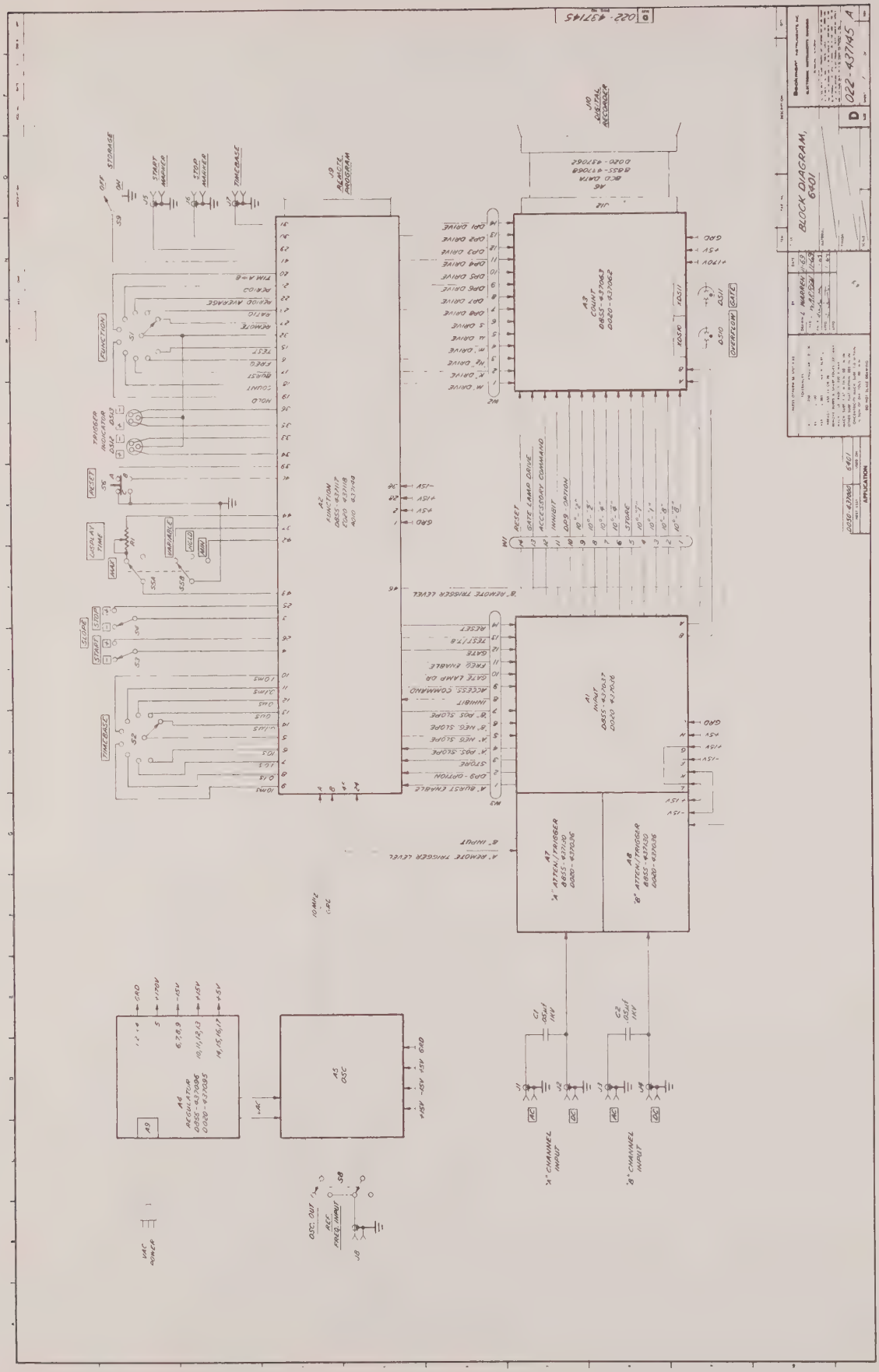
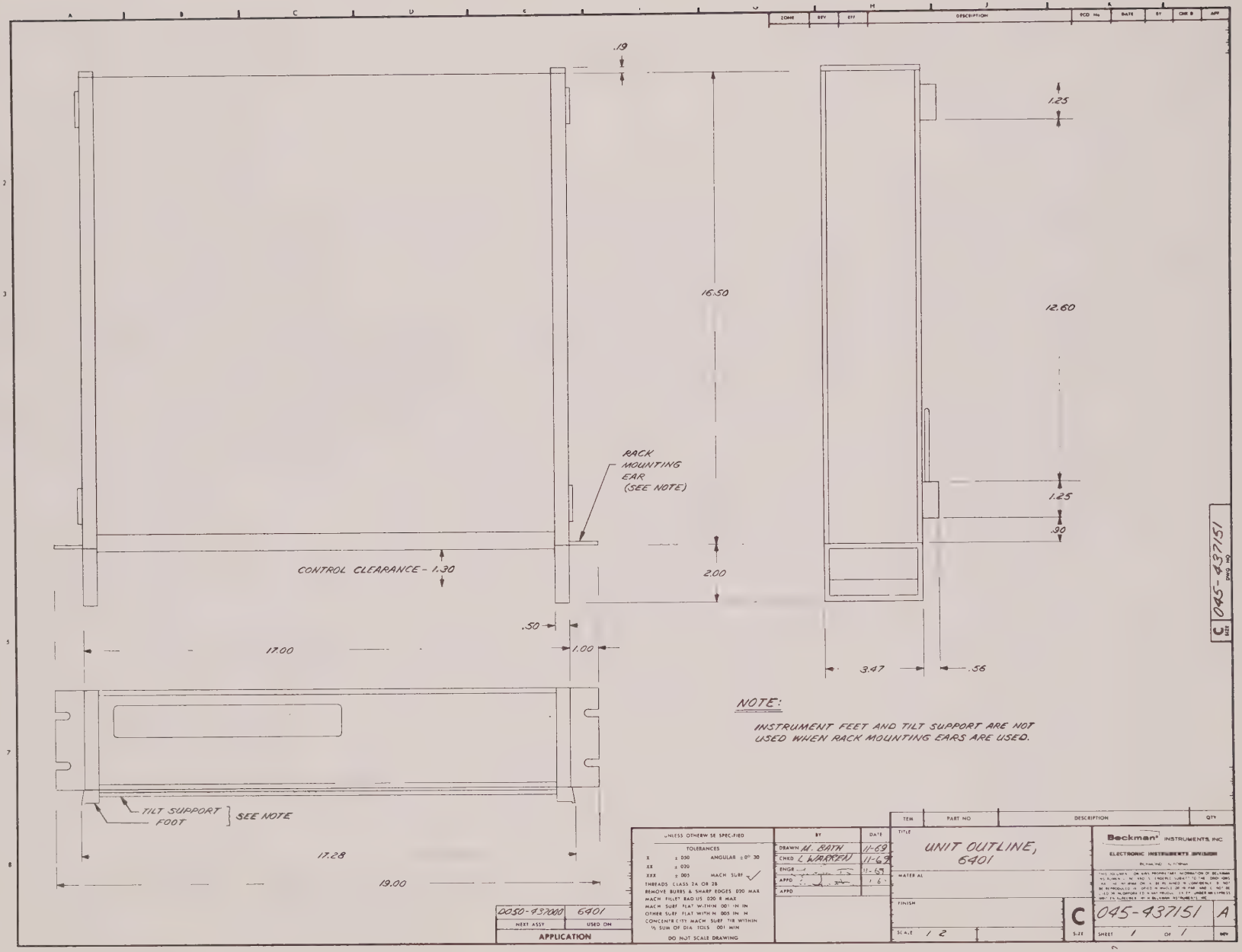
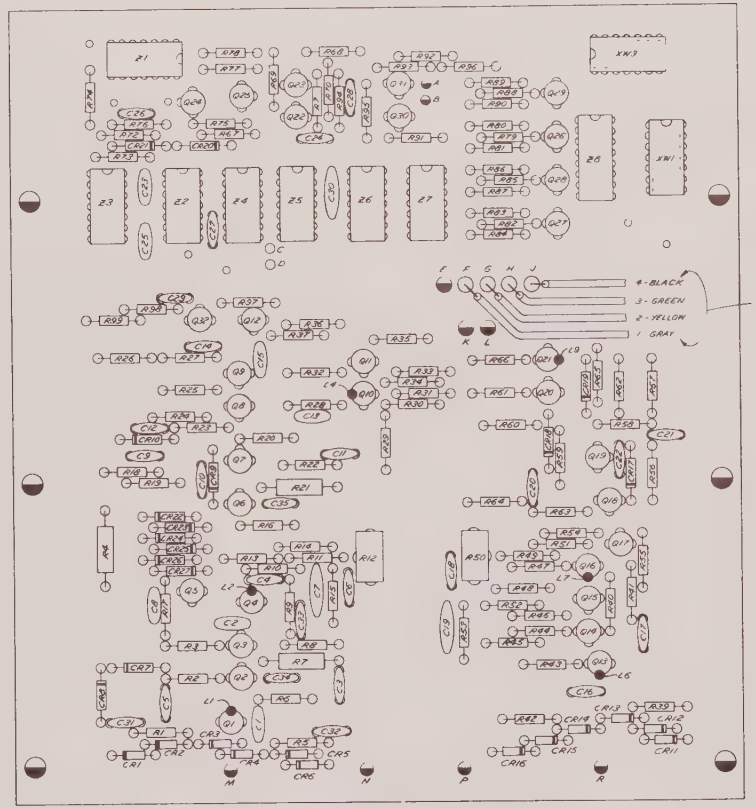
Atten/Trigger Switch Assembly Diagram (A7, A8) w/Parts List	B-437130-A	2-20
Front Panel Mechanical & Wired Assembly Diagram	C-437126-A	2-21
Rear Panel Mechanical & Wired Assembly Diagram	C-437133-A	2-22
Parts Lists: Front Panel Mechanical & Wired Assembly) Rear Panel Mechanical & Wired Assembly) Mechanical & Wired Assembly)		2-23
Mechanical & Wired Assembly Diagram	D-437142-A	2-24
Multiplier Board Assembly Diagram (used w/Timing Module)	C-437136-A	2-25
Multiplier Board Assembly Parts List		2-26
AA Timing Module Assembly Diagram	C-435640-C	2-27
AA Timing Module Assembly Parts List		2-28
Timing Module Assembly Diagram w/Parts List	A-437135-A	2-28
Timing Module Logic Diagram (A5)	C-437137-A	2-29
AA - 1 MHz Oscillator Board Assembly Diagram w/Parts List	B-435440-A	2-30
AA - 1 MHz Oscillator Schematic Diagram	B-435427-B	2-31

Note: BCD Board (A6) takes connector, Beckman Part No. 672-814649.




.19
16.50
RACK MOUNTING EAR (SEE NOTE)
CONTROL CLEARANCE - 1.30
2.00
.50
17.00
1.00
TILT SUPPORT FOOT
SEE NOTE
17.28
19.00
1.25
12.60
1.25
.90
3.47
.56
NOTE:
INSTRUMENT FEET AND TILT SUPPORT ARE NOT USED WHEN RACK MOUNTING EARS ARE USED.
045-437151
C
UNIT OUTLINE, 6401
Beckman INSTRUMENTS, INC
ELECTRONIC INSTRUMENTS DIVISION
045-437151 A
SCALE 1/2
SHEET 1 OF 1
0050-437000 6401
APPLICATION



NOTES:

1. ● - INDICATES FERRITE BEAD ON TRANSISTOR LEAD
2. ⊖ - INDICATES HOLES TO BE MASKED PRIOR TO SOLDERING.
3. 21-28 ARE SOCKET MOUNTED
4. SPECIAL PREPARATION REQUIRED FOR CR1,2,3,4,5,6,11,12,13,14,15,16 NON-STANDARD SPACING
5. INSERT WIRES PRIOR TO SOLDERING OPERATION WIRE LIST A039-437127
6. L1,L2,L6 & L7 MUST BE INSULATED TO PREVENT THEM FROM TOUCHING ADJACENT TRANSISTOR LEADS

TYPICAL FOR 4 LEADED TRANSISTORS; REMOVE LEAD SHOWN:

REV	ZONE	DESCRIPTION	ECO No.	DATE	BY	CHK'D
B		COMPONENT RELAYOUT	12288	12-69	L.W.	

ITEM	PART NO	DESCRIPTION	QTY
2	0020-437038	SCHEMATIC INPUT BOARD	REF.
1	A037 437038	PARTS LIST, INPUT BD.	1

DRAWN	K. Shimada 12/6/69
CHKD	
ENGR	
MFG	
MATERIAL	
FINISH	
SCALE	2:1

P.C. BOARD ASSY, INPUT - AI

Beckman INSTRUMENTS, INC. ELECTRONIC COMPONENTS DIVISION

SIZE D | 855-437037 | REV B | SHEET 1 OF 1

855-437037 B

855-437192 | 6401 | NEXT ASSY | USED ON

APPLICATION

INPUT BOARD ASSEMBLY (A1) - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	D-437037-B	Input Board (A1)	Beckman	
C1, 25	637-822251	Capacitor, F. Mica, 100pf, 500V, 5%	*DM15-F101J0-WV4CR	2
C2, 13, 26	637-825071	Capacitor, F. Mica, 27pf, 500V, 5%	DM15-E270J0-WV4CR	3
C3, 5, 6, 9, 10, 11, 12, 14, 17, 18, 20, 21, 22, 24, 28, 29, 31, 32, 33	633-836864	Capacitor, F. Cerm., 0.01μf, 100V	Sprague C023B101F-103M	19
C4, 16, 27	633-857571	Capacitor, F. Cerm., 47pf	Sprague 5GA-Q47	3
C7, 19, 30	633-815873	Capacitor, F. Cerm., 0.33μf, 25V	Sprague 5C023334D-8250B3	3
C8, 23, 35	637-825069	Capacitor, F. Mica, 10pf, 500V, 5%	DM15-C100J0-WV4CR	3
C15, 34	637-857581	Capacitor, F. Mica, 6pf, 500V, 5%	DM15-C060D0-WV4CR	2
CR1, 2, 3, 4, 5, 6, 7, 11, 12. 13, 14, 15, 16, 20 thru 27	755-838731	Diode, 1N4448	Continental Devices	21
CR8, 18	755-832774	Diode, Zener, 8.2V, 5%, 1N756A	Motorola	2
CR9	755-814019	Diode, Zener, 6.8V, 5%, 1N754A	Motorola	1
CR10	755-818496	Diode, Zener, 5.1V, 5%, 1N751A	Motorola	1
CR17	755-822858	Diode, Zener, 6.2V, 5%, 1N753A	Continental Devices	1
CR19	755-836043	Diode, Zener, 12.0V, 5%, 1N759A	Motorola	1
L1, 2, 4, 6, 7, 9	783-807862	Ferrite Bead	Ferroxcube 56-590-65/3B	6
Q1 & Q4, Q13 & Q16	755-857548	Transistor, Matched Pair	Tex. Instr. TIS69	2 pr.
Q2, 3	755-857328	Transistor, 40235	RCA	2
Q5, 8, 9, 12, 17, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32	755-845089	Transistor, 2N4258	Fairchild	15
Q6, 7	755-857419	Transistor, 2N5179	RCA	2
Q10, 11, 14, 15, 18, 19, 20, 21, 24	755-857274	Transistor, 2N4275	Fairchild	9
R1, 5, 39, 42, 45	601-822295	Resistor, 2.7K, 1/4W, 5%	**A. B. CB2725	5
R2, 3, 10, 56, 58, 69, 73, 76, 81, 84, 87, 90	601-823394	Resistor, 330Ω, 1/4W, 5%	A. B. CB3315	12
R4	601-015442	Resistor, 150Ω, 1/2W, 5%	A. B. EB1515	1
R6, 9, 43, 47	601-823902	Resistor, 47K, 1/4W, 5%	A. B. CB4735	4
R7, 21	601-008129	Resistor, 1.5K, 1/2W, 5%	A. B. EB1525	2
R8, 20, 64	601-817735	Resistor, 100Ω, 1/4W, 5%	A. B. CB1015	3
R11	601-823397	Resistor, 5.6K, 1/4W, 5%	A. B. CB5625	1

continued. . .

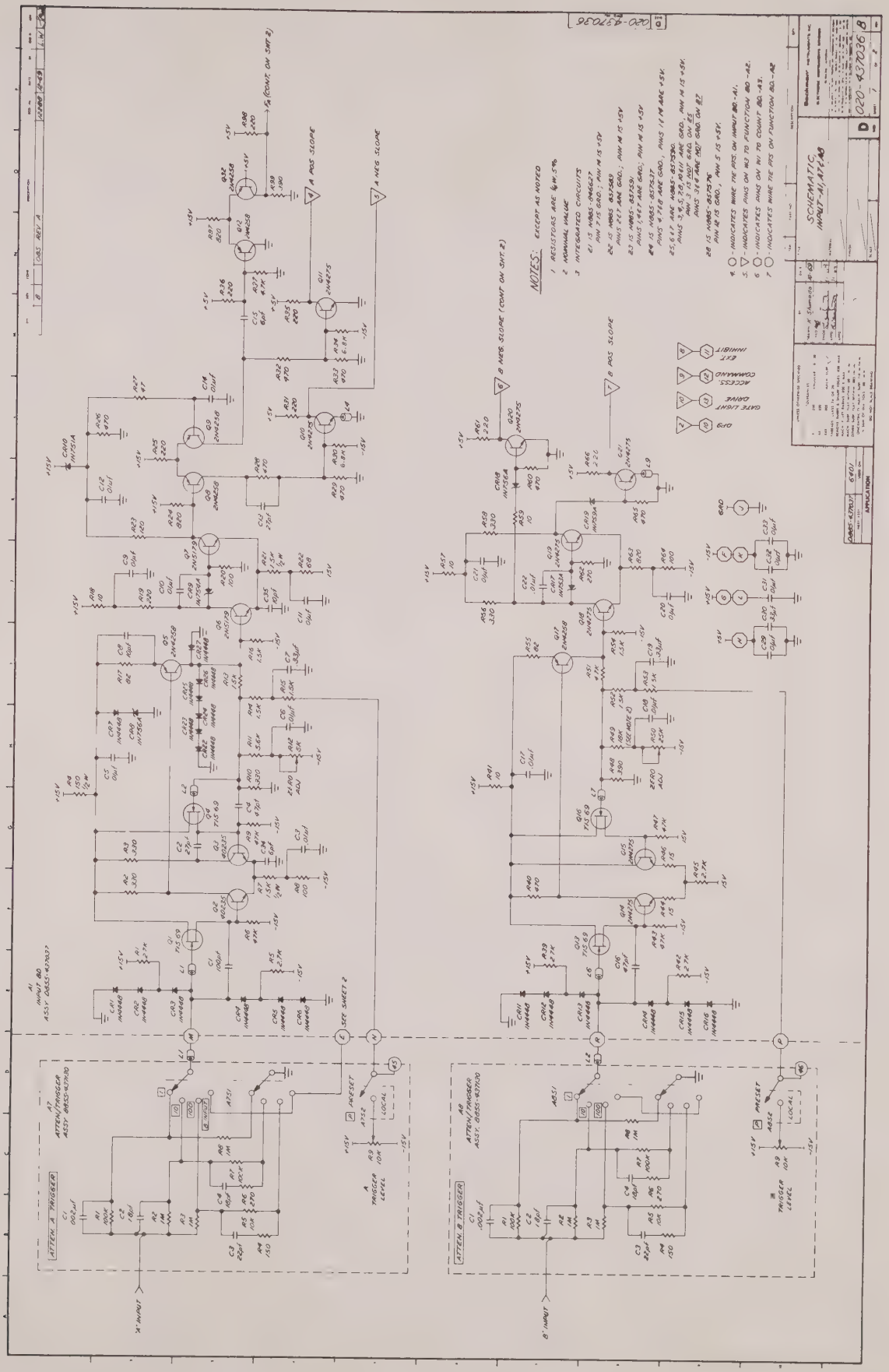
*"DM15. . . . WV4CR" are Electromotive capacitors.

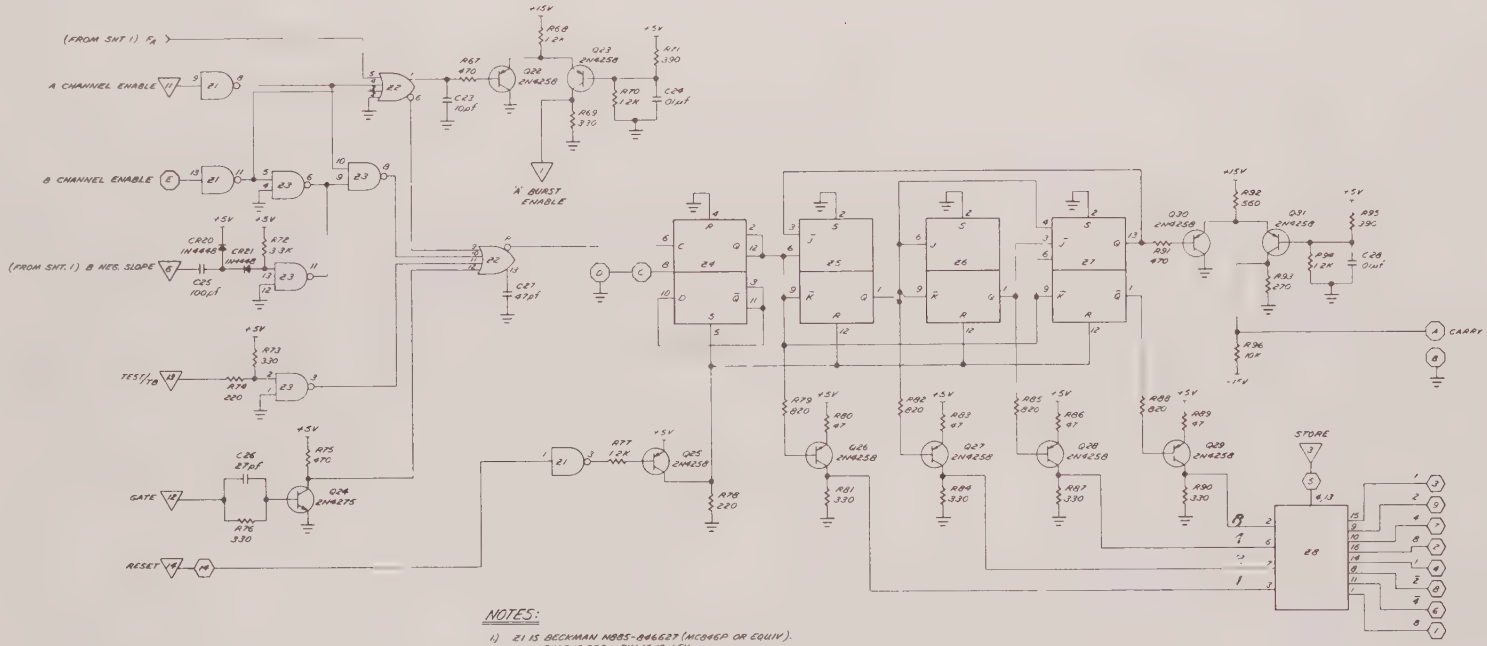
**"A. B." are Allen Bradley, fixed composition resistors.

INPUT BOARD ASSEMBLY (A1) - PARTS LIST - continued

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
R12	614-857573	Resistor, Variable, 5K, 1/8W, 20%	CTS X201R502B	1
R13, 14, 15, 16, 52, 53, 54	601-822527	Resistor, 1.5K, 1/4W, 5%	*A. B. CB1525	7
R17, 55	601-822375	Resistor, 82Ω, 1/4W, 5%	A. B. CB8205	2
R18, 41, 57, 59	601-823379	Resistor, 10Ω, 1/4W, 5%	A. B. CB1005	4
R19, 25, 31, 35, 36, 61, 66, 74, 78, 98	601-822327	Resistor, 220Ω, 1/4W, 5%	A. B. CB2215	10
R22	601-823389	Resistor, 68Ω, 1/4W, 5%	A. B. CB6805	1
R23	601-823390	Resistor, 120Ω, 1/4W, 5%	A. B. CB1215	1
R24, 63, 79, 82, 85, 88, 97	601-822306	Resistor, 820Ω, 1/4W, 5%	A. B. CB8215	7
R26, 28, 29, 32, 33, 40, 60, 65, 67, 75, 91	601-823395	Resistor, 470Ω, 1/4W, 5%	A. B. CB4715	11
R27, 80, 83, 86, 89	601-823387	Resistor, 47Ω, 1/4W, 5%	A. B. CB4705	5
R30, 34	601-822299	Resistor, 6.8K, 1/4W, 5%	A. B. CB6825	2
R37, 51	601-822297	Resistor, 4.7K, 1/4W, 5%	A. B. CB4725	2
R44, 46	601-823381	Resistor, 15Ω, 1/4W, 5%	A. B. CB1505	2
R48, 71, 95, 99	601-822371	Resistor, 390Ω, 1/4W, 5%	A. B. CB3915	4
R49	601-822335	Resistor, 27K, 1/4W, 5%	A. B. CB2735	1
R50	614-864261	Resistor, Variable, 25K, 1/8W, 20%	CTS X-201	1
R62, 93	601-823393	Resistor, 270Ω, 1/4W, 5%	A. B. CB2715	2
R68, 70, 77, 94	601-822326	Resistor, 1.2K, 1/4W, 5%	A. B. CB1225	4
R72	601-822296	Resistor, 3.3K, 1/4W, 5%	A. B. CB3325	1
R92	601-823396	Resistor, 560Ω, 1/4W, 5%	A. B. CB5615	1
R96	601-822324	Resistor, 10K, 1/4W, 5%	A. B. CB1035	1
XZ1 thru XZ7, XW1, XW3	860-857545	Socket, I. C., 14-Pin Dual In-Line	Cinch Mfg. Co. 133-51-02-003	9
XZ8	860-857544	Socket, I. C., 16-Pin Dual In-Line	Cinch Mfg. Co. 51-02-006	1
Z1	885-846627	I. C., MC846P	Motorola	1
Z2	885-857589	I. C., MC1023P, or equivalent	Motorola	1
Z3	885-857591	I. C., MC1010P, or equivalent	Motorola	1
Z4	885-857537	I. C., MC1034P	Motorola	1
Z5, 6, 7	885-857590	I. C., MC1013P, or equivalent	Motorola	3
Z8	885-857576	I. C., SN7475N, or equivalent	Texas Instruments	1

*"A. B." are Allen Bradley, fixed composition, resistors.

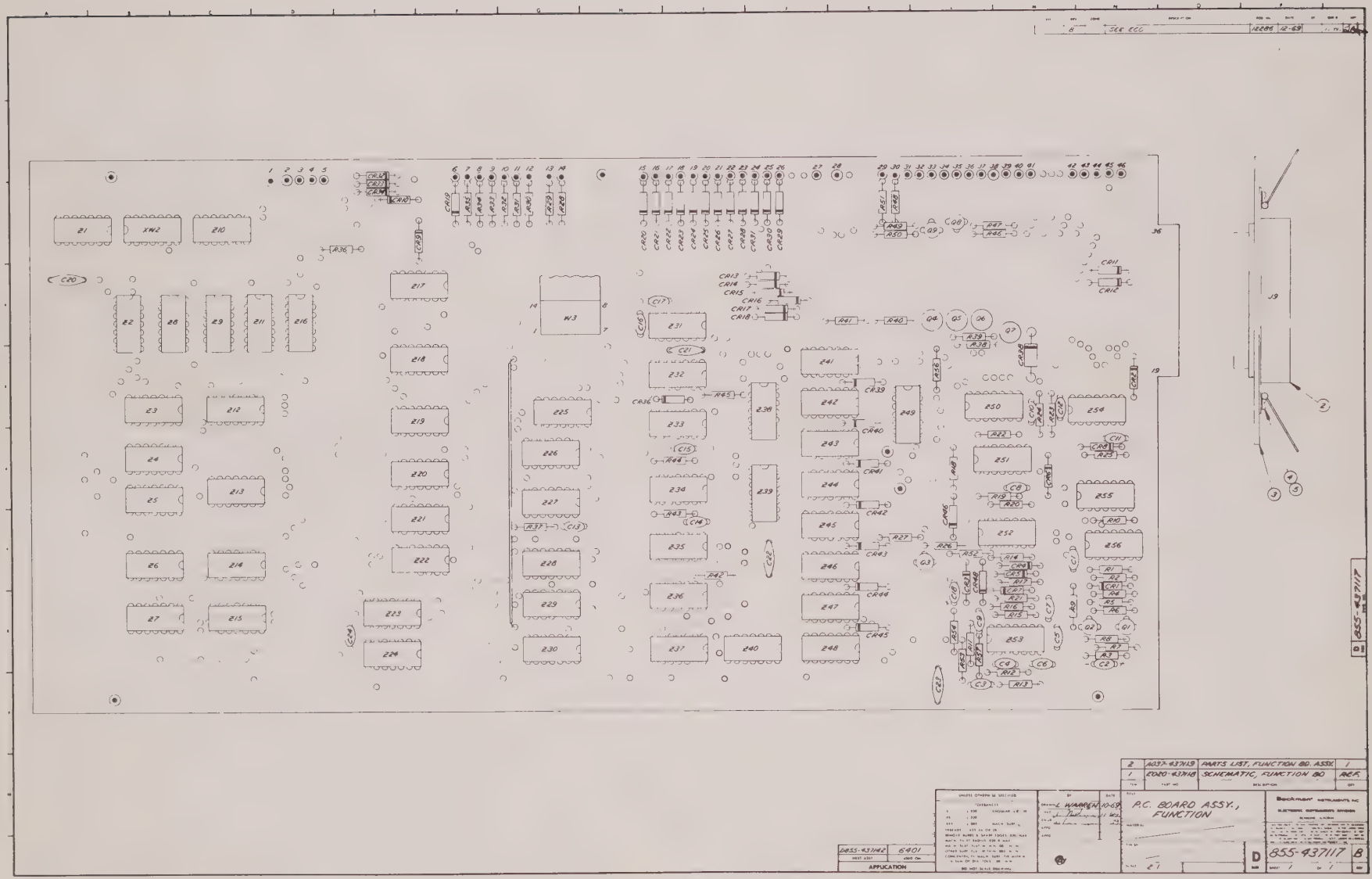

SCHEMATIC
INPUT-A1, A1A2A3
D 020-437036 B
NOTES: EXCEPT AS NOTED
1 RESISTORS ARE 1/4W 5%
2 NOMINAL VALUE
3 INTEGRATED CIRCUITS
#1 IS NOBS-040627
PIN 7 IS GND; PIN 14 IS +5V
#2 IS NOBS 837383
PINS 2&11 ARE GND; PIN 14 IS +5V
#3 IS NOBS-837330
PINS 7 & 14 ARE GND; PINS 11 & 14 ARE +5V.
#5 & 6 ARE NOBS-837330
PINS 3, 6, 8, 10, 11 & 14 ARE GND, PIN 14 IS +5V.
PINS 1 & 13 NOT GND OR +5V
#7 IS NOBS-837376
PIN 14 IS GND, PIN 5 IS +5V.
○ - INDICATES WIRE TIE PTS ON INPUT BD. -A1.
▽ - INDICATES PINS ON W2 TO FUNCTION BD. -A2.
○ - INDICATES PINS ON W1 TO COUNT BD. -A3.
○ - INDICATES WIRE TIE PTS ON FUNCTION BD. -A2
A POS SLOPE
A NEG SLOPE
B NEG SLOPE (COMP ON SHT 2)
B POS SLOPE
GATE LIGHT DRIVE
ACCESS COMMAND
EXT INHIBIT
A1 INPUT BD ASSY 040535-437037
A7 ATTEN/TRIGGER ASSY 040535-437030
A8 ATTEN/TRIGGER ASSY 040535-437030
ATTEN A TRIGGER
ATTEN B TRIGGER
A TRIGGER LEVEL
B TRIGGER LEVEL
A PRESET
B PRESET
LOCAL
X INPUT
Y INPUT
SEE SHEET 2
SEE SHEET 3
(COUNT ON SHT 3)



NOTES:

1) 21 IS BECKMAN N885-846627 (MC846P OR EQUIV).
   PIN 7 IS GRD., PIN 14 IS +5V.
2) 22 IS BECKMAN N885-857589 (MC1083P OR EQUIV).
   PIN 7 IS GRD., PIN 14 IS +5V
3) 23 IS BECKMAN N885-857591 (MC1010P OR EQUIV).
   PIN 7 IS GRD., PIN 14 IS +5V.
4) 24 IS BECKMAN N885-857537 (MC1034P OR EQUIV).
   PIN 7 IS GRD., PIN 14 IS +5V.
5) 25, 26, 27 ARE BECKMAN N885-857590 (MC1013P OR EQUIV.)
   PIN 7 IS GRD., PIN 14 IS +5V; ALL UNUSED INPUTS GROUNDED
6) 28 IS BECKMAN N885-857576 (SN7475 OR EQUIV.).
   PIN 12 IS GRD, PIN 5 IS +5V

APPLICATION	SCHEMATIC, INPUT-A, ATE A3	D 020-937036 B


P.C. BOARD ASSY., FUNCTION
L WARREN 10-69
APPLICATION
6401
0855-937142
855-937117 B
0855-937117
2 0037-937119 PARTS LIST, FUNCTION BD. ASSY. 1
1 E000-937118 SCHEMATIC, FUNCTION BD REF.

FUNCTION BOARD ASSEMBLY (A2) - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	D-437117-B	Function Board Assembly	Beckman	
C1, 15	637-826136	Capacitor, 120pf, 500V, 5%	*DM15F121J0-500WV4CR	2
C2, 18	631-857569	Capacitor, 33μf, 15V, 20%	Sprague 196D336X0015FB	2
C3	637-822973	Capacitor, 68pf, 500V, 5%	DM15E680J0-500WV4CR	1
C4	637-837854	Capacitor, 240pf, 500V, 5%	DM15F241J0-500WV4CR	1
C5	633-857080	Capacitor, 3300pf, 500V, 20%	Sprague 19C404A	1
C6, 8	637-822251	Capacitor, 100pf, 500V, 5%	DM15F101J0-500WV4CR	2
C7, 11, 12, 24	633-836864	Capacitor, 0.01μf, 100V	Sprague C023B101F103M	4
C9	633-846738	Capacitor, 0.02μf, 50V, 20%	Sprague 55C21A2	1
C10, 16, 17	637-822908	Capacitor, 330pf, 500V, 5%	DM15F331J0-500WV4CR	3
C13, 14	637-822771	Capacitor, 82pf, 500V, 5%	DM15E820J0-500WV4CR	2
C19	633-804706	Capacitor, 0.001μf, 1KV	Centralab DD-102	1
C20, 21, 22, 23	633-815873	Capacitor, 0.33μf, 25V	Sprague 5C023334D8250B3	4
CR1 thru 31, 36,39 thru 46, 48	755-838731	Diode, 1N4448	Continental Devices	41
CR32, 33, 34	755-420893	Diode, Special	Beckman	3
CR38	755-416842	Diode, Special	Beckman	1
J9	672-824764	Connector, 36 Contact	Amphenol 57-40360	1
Q1	755-845089	Transistor, 2N4258	Fairchild	1
Q2, 3, 8, 9	755-857274	Transistor, 2N4275	Fairchild	4
Q4, 5, 6, 7	755-839888	Transistor, 2N3638A	Fairchild	4
R1, 2, 15, 16, 19, 20, 23, 24	601-822299	Resistor, 6.8K, 1/4W, 5%	**A.B. CB6825	8
R3, 11	601-822297	Resistor, 4.7K, 1/4W, 5%	A.B. CB4725	2
R4, 9, 10, 18, 22, 36	601-822308	Resistor, 1K, 1/4W, 5%	A.B. CB1025	6
R5	601-822296	Resistor, 3.3K, 1/4W, 5%	A.B. CB3325	1
R6	601-822460	Resistor, 3.9K, 1/4W, 5%	A.B. CB3925	1
R7	601-823384	Resistor, 27Ω, 1/4W, 5%	A.B. CB2705	1
R8	601-823912	Resistor, 470K, 1/4W, 5%	A.B. CB4745	1
R12, 13, 46, 49	601-823395	Resistor, 470Ω, 1/4W, 5%	A.B. CB4715	4
R14, 17, 21, 25, 52	601-822324	Resistor, 10K, 1/4W, 5%	A.B. CB1035	5
R26	601-822544	Resistor, 1.8K, 1/4W, 5%	A.B. CB1825	1
R27	601-822369	Resistor, 680Ω, 1/4W, 5%	A.B. CB6815	1
R28 thru 35, 45	601-823379	Resistor, 10Ω, 1/4W, 5%	A.B. CB1005	9

continued. . .

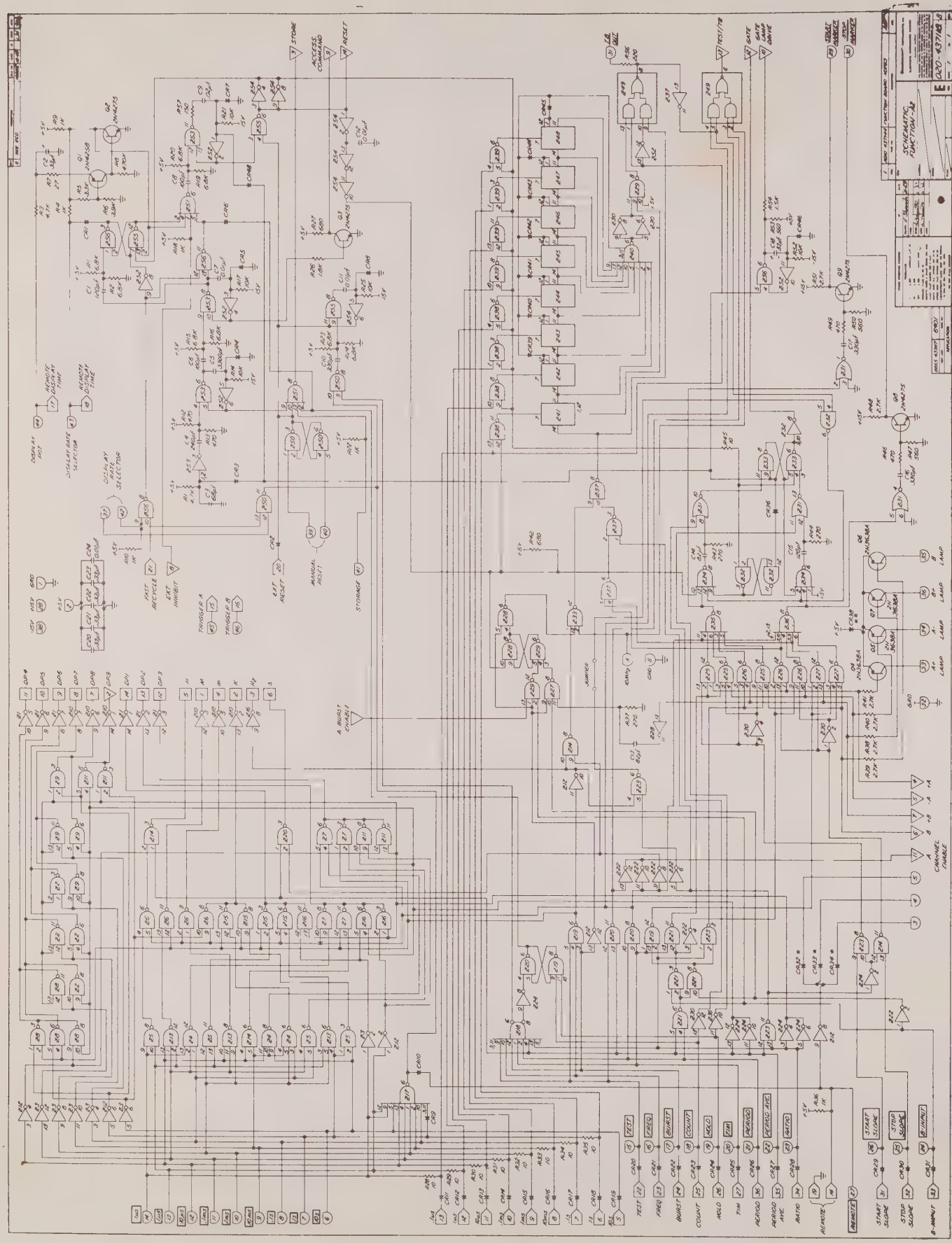
* "DM15...." are Electromotive capacitors.

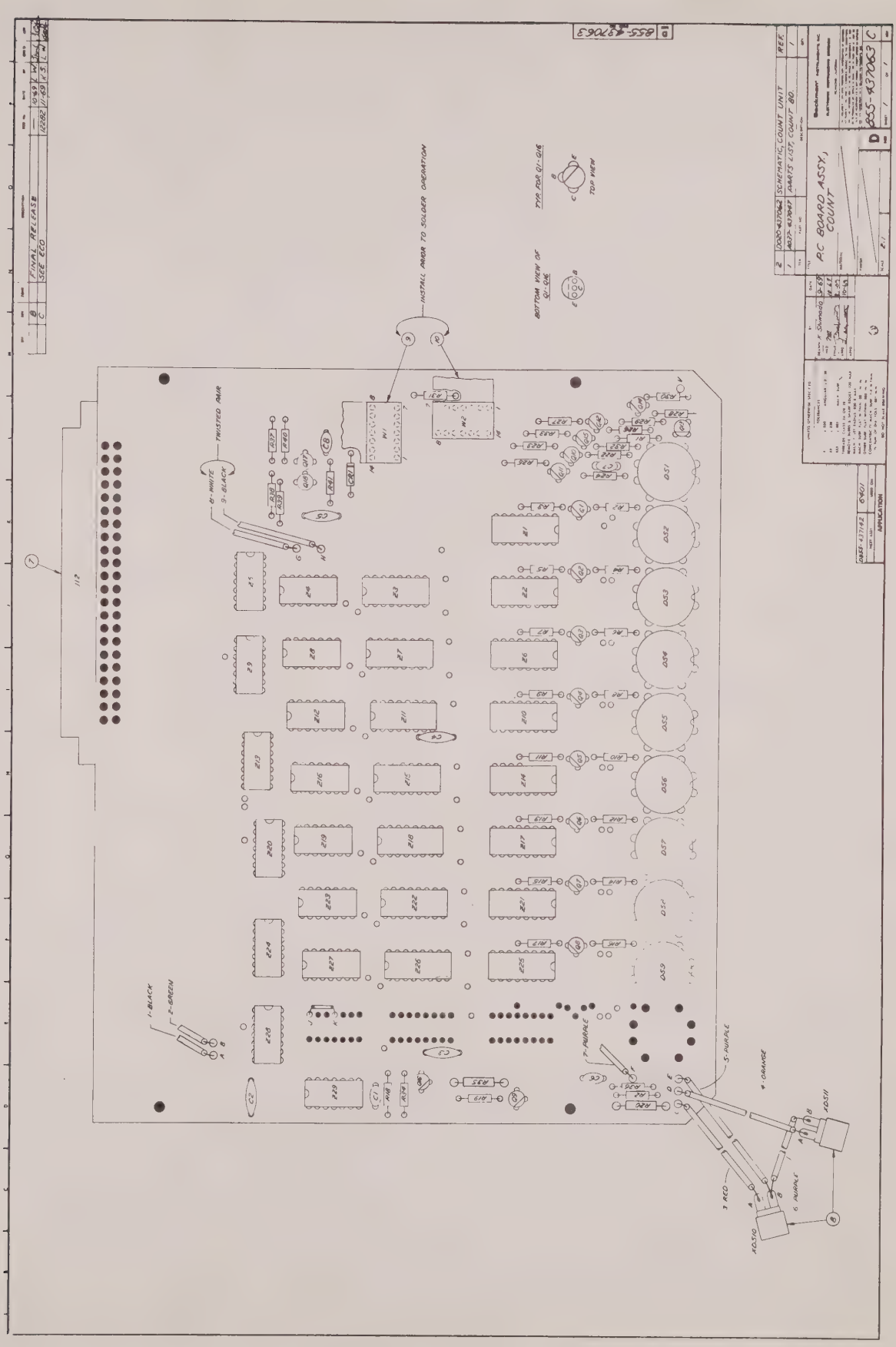
** "A.B." are Allen Bradley, fixed composition resistors.

FUNCTION BOARD ASSEMBLY (A2) - PARTS LIST - continued

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
R37, 43, 44	601-823393	Resistor, 270Ω, 1/4W, 5%	*A. B. CB2715	3
R38, 39, 40, 14, 49, 51	601-822295	Resistor, 2.7K, 1/4W, 5%	A. B. CB2725	6
R42	601-822371	Resistor, 390Ω, 1/4W, 5%	A. B. CB3915	1
R47, 50, 53	601-823396	Resistor, 560Ω, 1/4W, 5%	A. B. CB5615	3
R54	601-822527	Resistor, 1, 5K, 1/4W, 5%	A. B. CB1525	1
R57	601-823391	Resistor, 150Ω, 1/4W, 5%	A. B. CB1515	1
XZ1 thru XZ56, XW2	860-857545	I. C. Socket, 14 Position	Cinch Mfg. 133-51-02-003	57
Z1, 10	885-857580	I. C., MC889P, or equivalent	Motorola	2
Z2, 5, 6, 7, 8, 9, 11, 14, 15, 16, 20, 21, 23, 38, 39, 50, 56	885-846627	I. C., MC846P	Motorola	17
Z3, 12, 22, 24, 30, 52, 54	885-846628	I. C., MC837P	Motorola	7
Z4, 13, 19	885-846625	I. C., MC862P	Motorola	3
Z17, 18, 40	885-846631	I. C., MC830P	Motorola	3
Z25, 26, 27, 29, 55	885-857582	I. C., SN7410N, or equivalent	Texas Instruments	5
Z28, 32, 37	885-857583	I. C., SN7400N, or equivalent	Texas Instruments	3
Z31	885-857538	I. C., SN7402N	Texas Instruments	1
Z33	885-857584	I. C., SN74H10N, or equivalent	Texas Instruments	1
Z34	885-857586	I. C., SN7420N, or equivalent	Texas Instruments	1
Z35, 36	885-857575	I. C., SN7430N	Texas Instruments	2
Z41 thru Z48	885-857577	I. C., SN7490N, or equivalent	Texas Instruments	8
Z49	885-857555	I. C., SN7450N	Texas Instruments	1
Z51	885-857585	I. C., SN7420N, or equivalent	Texas Instruments	1
Z53	885-857593	I. C., SN74H00N, or equivalent	Texas Instruments	1
W3	664-437125	Cable Assembly	Beckman	1

*"A. B." are Allen Bradley, fixed composition resistors.

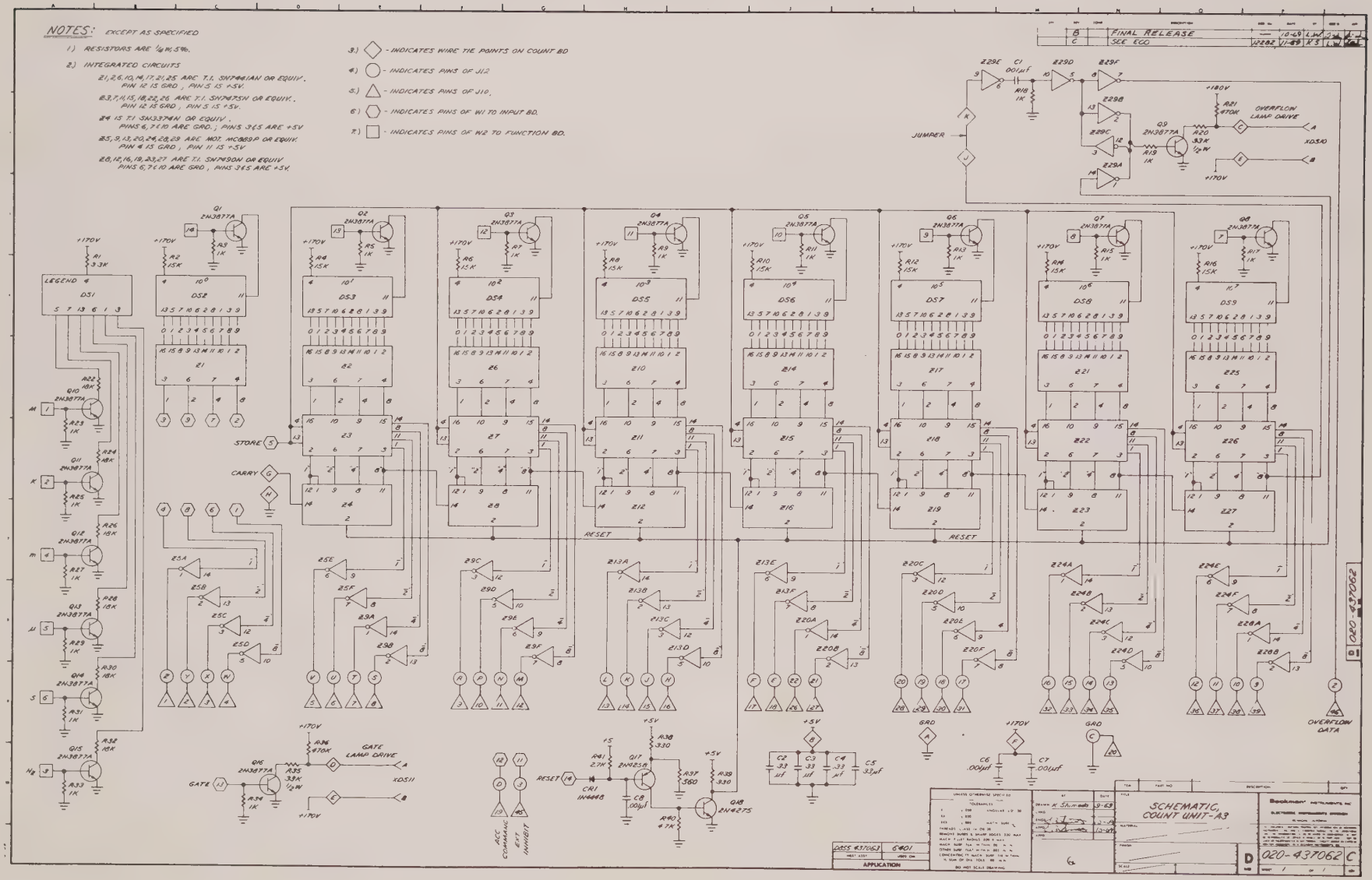


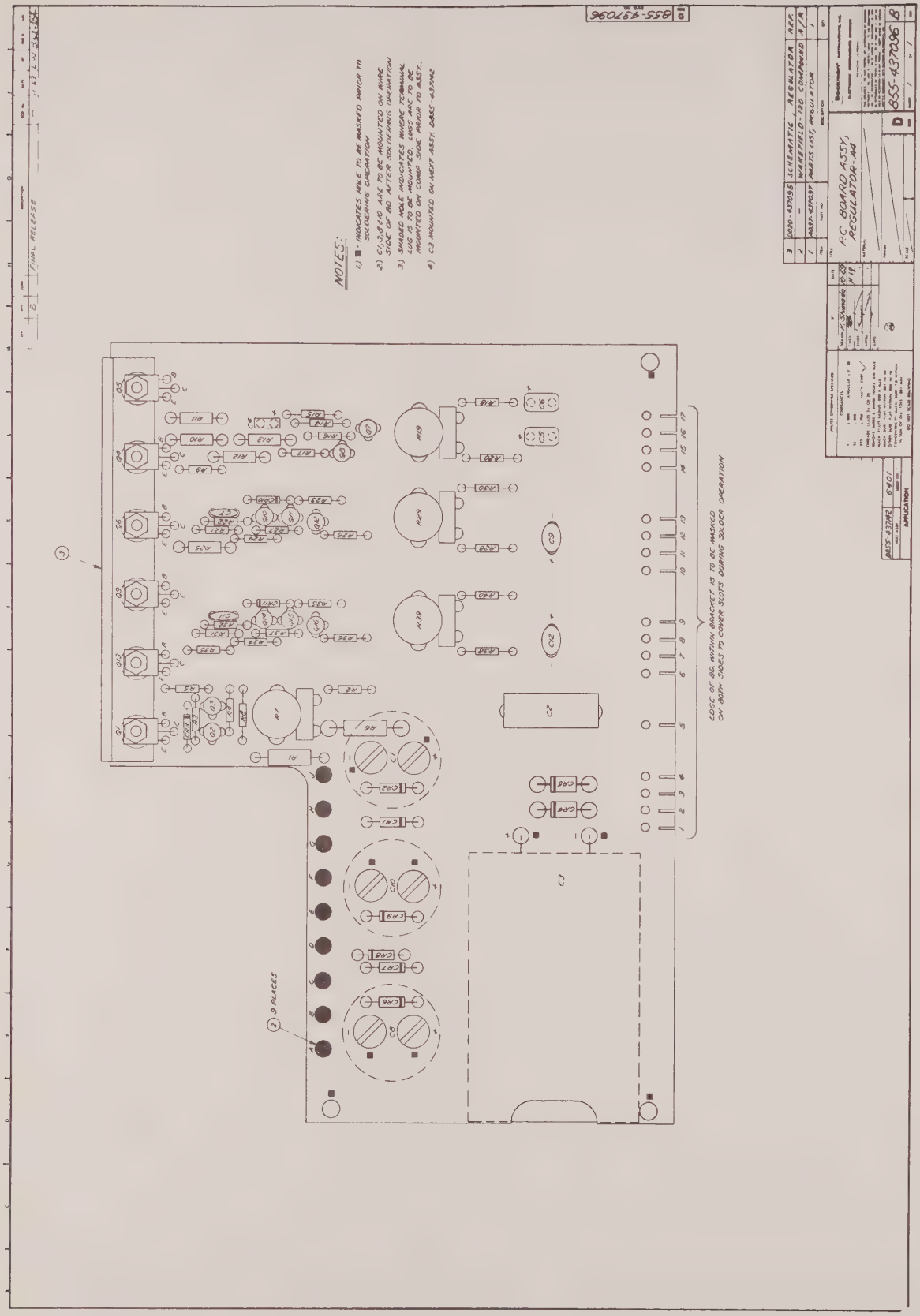

PC BOARD ASSY, COUNT
SCHEMATIC, COUNT UNIT
PARTS LIST, COUNT BD.
FINAL RELEASE
SEE ECO
INSTALL JUMPER TO SOLDER OPERATION
BOTTOM VIEW OF Q1-Q16
TOP VIEW
TYP FOR Q1-Q16
TWISTED PAIR
1-BLACK
2-GREEN
3-WHITE
4-BLACK
5-PURPLE
6-ORANGE
7-RED
8-PURPLE
J051
J052
J053
J054
J055
J056
J057
J058
J059
J060
J061
J062
J063
J064
J065
J066
J067
J068
J069
J070
J071
J072
J073
J074
J075
J076
J077
J078
J079
J080
J081
J082
J083
J084
J085
J086
J087
J088
J089
J090

COUNT BOARD ASSEMBLY (A3) - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	D-437063-C	Count Board (A3)	Beckman	
C1, 6, 7, 8	633-804706	Capacitor, F. Cerm., 0.001μf, 1KV, ±10%	Centralab DD-102	4
C2, 3, 4, 5	633-815873	Capacitor, F. Cerm., 0.33μf, 25V, ±20%	Sprague 5C023334-D8250B3	4
CR1	755-838731	Diode, 1N4448	Continental Devices	1
DS1	751-857284	Readout Tube, Legend	Nat'l Eltrn's. NL-867	1
DS2 thru DS9	751-857285	Readout Tube, Numerical	Nat'l Eltrn's. NL-842	8
J12	680-857546	Connector, 22 Double R/O	Amphenol 225-22221-105	1
Q1 thru Q16	755-846287	Transistor, 2N3877A	G.E.	16
Q17	755-845089	Transistor, 2N4258	Fairchild	1
Q18	755-857274	Transistor, 2N4275	Fairchild	1
R1	601-822296	Resistor, 3.3K, 1/4W, 5%	*A.B. CB3325	1
R2, 4, 6, 8, 10, 12, 14, 16	601-822301	Resistor, 15K, 1/4W, 5%	A.B. CB1535	8
R3, 5, 7, 9, 11, 13, 15, 17, 18, 19, 23, 25, 27, 29, 31, 33, 34	601-822308	Resistor, 1K, 1/4W, 5%	A.B. CB1025	17
R20, 35	601-015060	Resistor, 33K, 1/2W, 5%	A.B. EB3335	2
R21, 36	601-823912	Resistor, 470K, 1/4W, 5%	A.B. CB4745	2
R22, 24, 26, 28, 30, 32	601-822303	Resistor, 18K, 1/4W, 5%	A.B. CB1835	6
R37	601-823396	Resistor, 560Ω, 1/4W, 5%	A.B. CB5615	1
R38	601-823394	Resistor, 330Ω, 1/4W, 5%	A.B. CB3315	1
R40	601-822297	Resistor, 4.7K, 1/4W, 5%	A.B. CB4725	1
R41	601-822295	Resistor, 2.7K, 1/4W, 5%	A.B. CB2735	1
XDS1 thru 9	860-857331	Socket, Readout	Nat'l RTS-29	9
XDS10, 11	824-846653	Socket, Lamp	Eldema Q082-2K	2
XZ1, 2, 3, 6, 7, 10, 11, 14, 15, 17, 18, 21, 22, 25, 26	860-857544	Socket, I.C., 16-Pin Dual Inline	Cinch Mfg. Co. 133-51-02-006	15
XZ4, 5, 8, 9, 12, 13, 16, 19, 20, 23, 24, 27, 28, 29	860-857545	Socket, I.C., 14-Pin Dual Inline	Cinch Mfg. Co. 133-51-02-003	14
Z1, 2, 6, 10, 14, 17, 21, 25	885-857578	I.C., BCD-to-Decimal Decoder, SN7441AN	Texas Instruments	8
Z3, 7, 11, 15, 18, 22, 26	885-857576	I.C., Quadruple Bistable Latch, SN7475N	Texas Instruments	7
Z4	885-857579	I.C., Decade Counter/25 MHz, SN3374N	Texas Instruments	1
Z5, 9, 13, 20, 24, 28, 29	885-857580	I.C., Hex Inverter MC889P	Motorola	7
Z8, 12, 16, 19, 23, 27	885-857577	I.C., Decade Counter/10 MHz, SN7490N	Texas Instruments	6

*"A.B." are Allen Bradley, fixed composition resistors.


NOTES: EXCEPT AS SPECIFIED
1.) RESISTORS ARE 1/4 W, 5%.
2.) INTEGRATED CIRCUITS
21,26,10,14,17,21,25 ARE T.I. SN7441AN OR EQUIV. PIN 12 IS GRD, PIN 5 IS +5V.
23,7,11,15,18,22,26 ARE T.I. SN7475N OR EQUIV. PIN 12 IS GRD, PIN 5 IS +5V.
24 IS T.I. SN3374N OR EQUIV. PINS 6,7,10 ARE GRD.; PINS 3&5 ARE +5V
25,9,13,20,24,28,29 ARE MOT. MC889P OR EQUIV. PIN 8 IS GRD, PIN 11 IS +5V
28,12,16,19,23,27 ARE T.I. SN7490N OR EQUIV. PINS 6,7,10 ARE GRD, PINS 3&5 ARE +5V.
3.) ◇ - INDICATES WIRE TIE POINTS ON COUNT BD
4.) ○ - INDICATES PINS OF J12
5.) △ - INDICATES PINS OF J10.
6.) ⬡ - INDICATES PINS OF W1 TO INPUT BD.
7.) □ - INDICATES PINS OF W2 TO FUNCTION BD.
B FINAL RELEASE 10-69 LW
C SEE ECO V2282 11-69 KS
SCHEMATIC, COUNT UNIT-A3
020-437062 C
020-437062 B
DASS 437062 6401
APPLICATION
D


NOTES:
1) ■ - INDICATES HOLE TO BE MASKED PRIOR TO SOLDERING OPERATION
2) C1, 3, & C40 ARE TO BE MOUNTED ON WIRE SIDE OF BD AFTER SOLDERING OPERATION
3) SHADED HOLE INDICATES WHERE TERMINAL LUG IS TO BE MOUNTED. LUGS ARE TO BE MOUNTED ON COMP SIDE PRIOR TO ASSY.
4) C9 MOUNTED ON HEAT ASSY. D855-437096
EDGE OF BD WITHIN BRACKET IS TO BE MASKED ON BOTH SIDES TO COVER SLOTS DURING SOLDER OPERATION
3 PLACES
PC BOARD ASSY, REGULATOR-A4
SCHEMATIC, REGULATOR
WAKEFIELD-120 COMPOUND
MASK REPAIR PARTS LIST, REGULATOR
D855-437096 B
6401
APPLICATION

REGULATOR BOARD (A4) - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty. / Assy.
	D855-437096-B	Regulator Board (A4)	Beckman	
C1	631-857554	Capacitor, Elect., 95μf, 350V	*36D950F350AA-2A	1
C2	641-859091	Capacitor, 0.1μf, 400V, 10%	Cornel D DPMS-4P1	1
C3	631-857552	Capacitor, Elect., 0.028f, 10V	*36D283G010BB-2A	1
C4	631-857567	Capacitor, Elect., 4.7μf, 25V, 20%	Kemet K4R7W25	1
C5, 6	631-857307	Capacitor, Elect., 250μf, 6V, 20%	Components, Inc. TSD5-6-257	2
C7, 11	633-836864	Capacitor, F. Cerm., 0.01μf, 100V	*C023B101F103M	2
C8, 10	631-857304	Capacitor, Elect., 2700μf, 25V	*36D272G025AA2B	2
C9, 12	631-857569	Capacitor, Elect., 33μf, 15V, 20%	*196D336X0015FB	2
CR1, 2, 6, 7, 8, 9	755-416842	Diode, Special	Beckman	6
CR3	755-857550	Diode, Zener, 75V, 1W, 10%, 1N4761	Motorola	1
CR4, 5	755-857551	Diode, 1N5198	Semtech	2
CR10, 11	755-818496	Diode, 5.1V, 5%, 1N751A	Motorola	2
Q1	755-866485	Transistor, 2N5195	Motorola	1
Q2, 3, 7, 8, 11, 12, 14	755-839888	Transistor, 2N3638A	Fairchild	7
Q4, 5, 9	755-862086	Transistor, 2N5193	Motorola	3
Q6, 13	755-862085	Transistor, 2N5190	Motorola	2
Q10, 15, 16	755-838784	Transistor, 2N3565	Fairchild	3
R1	601-800049	Resistor, 220Ω, 1W, 5%	**A. B. GB2215	1
R2	601-822301	Resistor, 15K, 1/4W, 5%	A. B. CB1535	1
R3	601-823397	Resistor, 5.6K, 1/4W, 5%	A. B. CB5625	1
R4	601-822297	Resistor, 4.7K, 1/4W, 5%	A. B. CB4725	1
R5, 23, 33, 35	601-822308	Resistor, 1K, 1/4W, 5%	A. B. CB1025	4
R6	601-800068	Resistor, 56K, 1W, 5%	A. B. GB5635	1
R7	614-836291	Resistor, Var., 1K, 1/8W, 30%	CTS U-201	1
R8	607-828896	Resistor, F. Film, 6.81K, 1/4W, 1%	IRC CEB-T0	1
R9, 21, 31	601-822296	Resistor, 3.3K, 1/4W, 5%	A. B. CB3325	3
R10, 11, 13	601-022946	Resistor, 10Ω, 1/2W, 5%	A. B. EB1005	3
R12	601-800005	Resistor, 22Ω, 1/2W, 5%	A. B. EB2205	1
R14	607-826634	Resistor, F. Film, 1.21K, 1/4W, 1%	IRC CEB-T0	1
R15	607-833110	Resistor, F. Film, 249Ω, 1/4W, 1%	IRC CEB-T0	1
R16, 22, 32	601-822527	Resistor, 1.5K, 1/4W, 5%	A. B. CB1525	3
R17, 27, 37	601-823396	Resistor, 560Ω, 1/4W, 5%	A. B. CB5615	3
R18, 20	607-833764	Resistor, F. Film, 182Ω, 1/4W, 1%	IRC CEB-T0	2
R19	614-844215	Resistor, Var., 100Ω, 1/8W, 30%	CTS U-201	1
R24, 34	601-822324	Resistor, 10K, 1/4W, 5%	A. B. CB1035	2

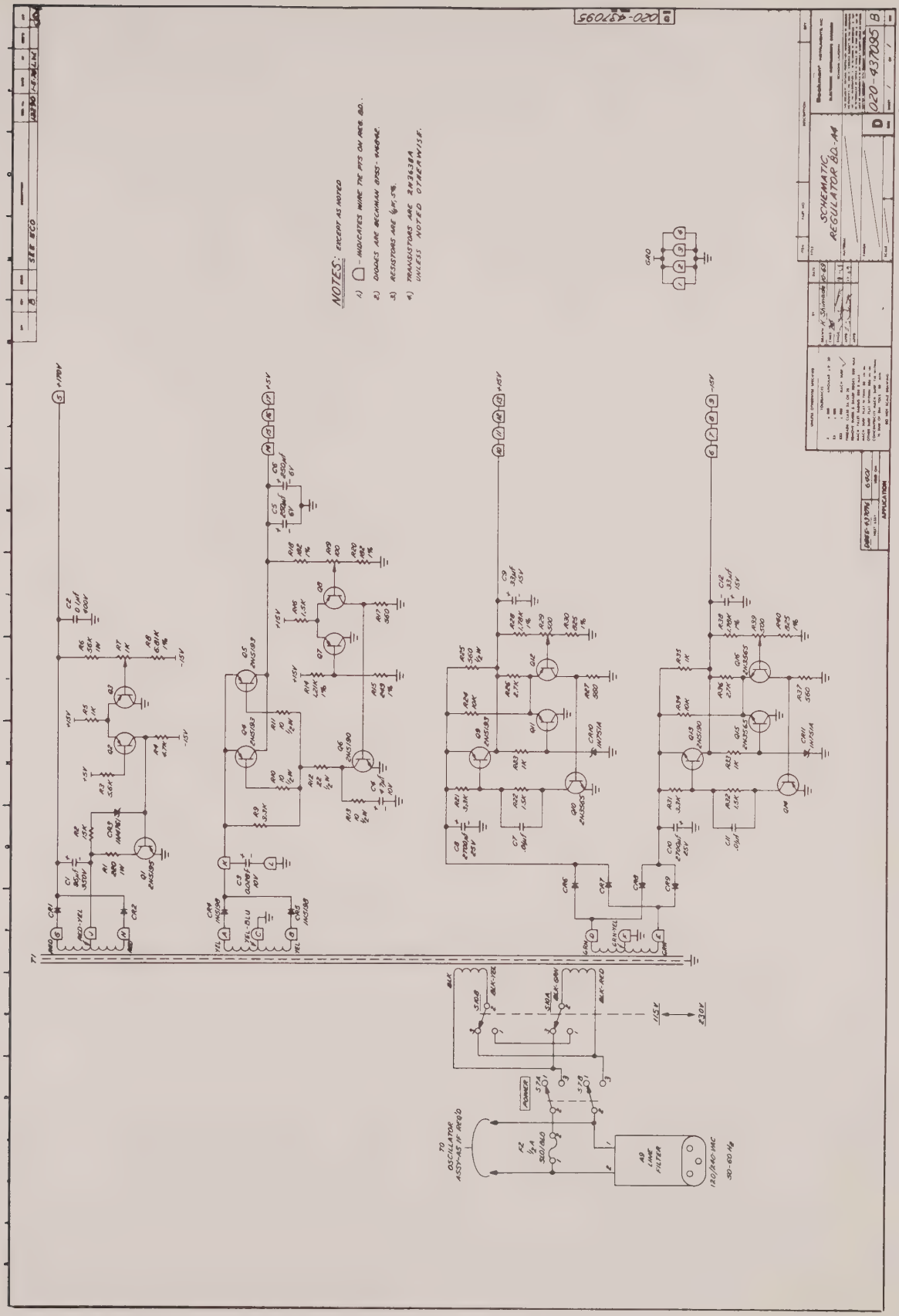
continued. . .

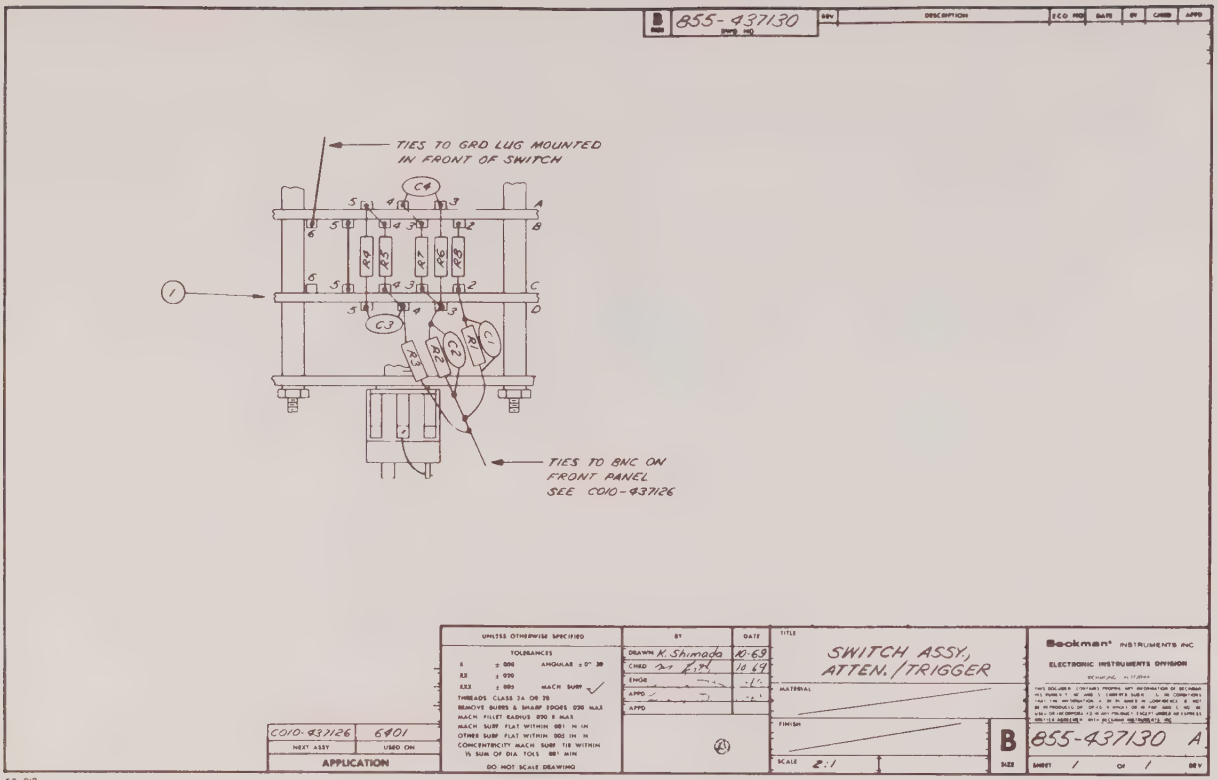
* Sprague capacitors.
** "A. B." are Allen Bradley, fixed composition, resistors.

REGULATOR BOARD (A4) - PARTS LIST - continued

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
R25	601-079492	Resistor, 560Ω, 1/2W, 5%	*A.B. EB5615	1
R26,36	601-822295	Resistor, 2.7K, 1/4W, 5%	A.B. CB2725	2
R28,38	607-821612	Resistor, F. Film, 1.78K, 1/4W, 1%	IRC CEB-T0	2
R29,39	614-857557	Resistor, Var., 500Ω, 1/8W, 20%	CTS U201R501B	2
R30,40	607-822186	Resistor, F. Film, 825Ω, 1/4W, 1%	IRC CEB-T0	2
	776-437093	Heat Sink	Beckman	1

*"A.B." are Allen Bradley, fixed composition, resistors.


NOTES: EXCEPT AS NOTED
1) ☐ - INDICATES WIRE THE PTS ON REG BD.
2) DIODES ARE MICRONAM 1N581 - 1N5806.
3) RESISTORS ARE ½W, 5%.
4) TRANSISTORS ARE 2N3638A UNLESS NOTED OTHERWISE.
SCHEMATIC, REGULATOR BD-AM
D 020-437095 B
020-437095 B
GRD
+15V
-15V
+5V
+10V
-10V
+30V
Q1 2N5087
Q2 2N5087
Q3 2N5087
Q4 2N5086
Q5 2N5087
Q6 2N5086
Q7 2N5087
Q8 2N5087
Q9 2N5087
Q10 2N5086
Q11 2N5087
Q12 2N5086
Q13 2N5086
Q14 2N5087
Q15 2N5086
Q16 2N5087
Q17 2N5086
CR1 RED-YEL
CR2
CR3 1N5388
CR4 1N5388
CR5 1N5388
CR6 1N5388
CR7 1N5388
CR8 1N5388
CR9 1N5388
CR10 1N5314
CR11 1N5314
CR12 1N5388
C1 .05µf 450V
C2 0.1µf 400V
C3 .022µf 400V
C4 .1µf 50V
C5 2200µf 6V
C6 .1µf 50V
C7 .1µf 50V
C8 2700µf 25V
C9 33µf 15V
C10 2700µf 25V
C11 .05µf
C12 33µf 15V
R1 1K
R2 12K
R3 5.6K
R4 47K
R5 1K
R6 56K 1W
R7 1K
R8 6.81K 1%
R9 5.11K 1%
R10 5.11K 1%
R11 0 ½W
R12 2K ½W
R13 0 ½W
R14 1.21K 1%
R15 2.43K 1%
R16 2.43K 1%
R17 360
R18 1.78K 1%
R19 500
R20 825 1%
R21 1K
R22 1.5K
R23 3.3K
R24 47K
R25 500 ½W
R26 2.7K
R27 360
R28 1.78K 1%
R29 500
R30 825 1%
R31 1K
R32 1.5K
R33 3.3K
R34 47K
R35 1K
R36 2.7K
R37 360
R38 1.78K 1%
R39 500
R40 825 1%
S1 1/4A 300/180
S2A
S2B
S3A
S3B
POWER
AUX
AUX-YEL
AUX-GRN
AUX-RED
TO OSCILLATOR ASSY-437096 (P1-P10)
TO 437096 P1
AC LINE FILTER
120/240 VAC 50-60 Hz
P1

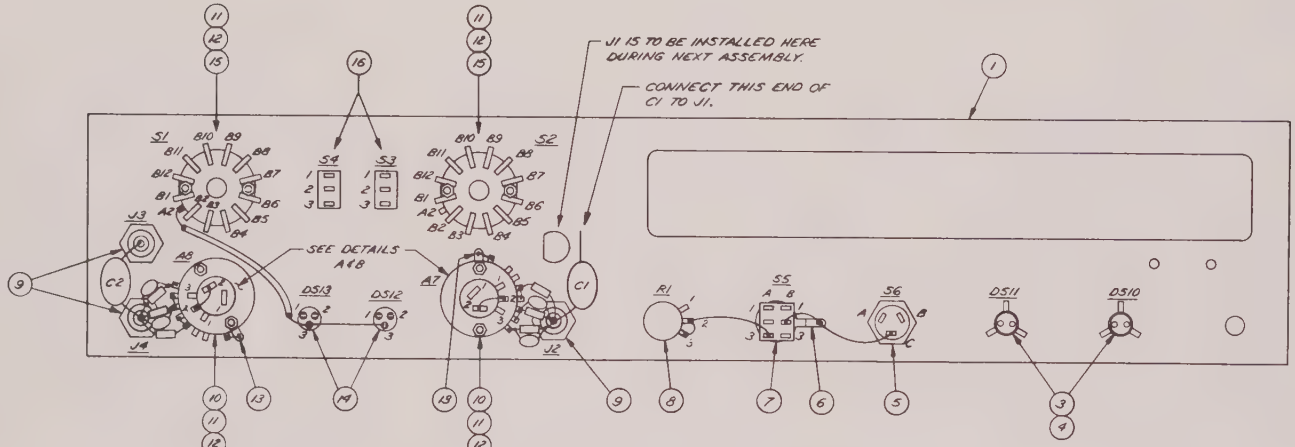


50

ATTEN./TRIGGER SWITCH ASSEMBLY (A7, A8) - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	B855-437130-A	Atten./Trigger Switch Assembly	Beckman	
C1	633-857033	Capacitor, 0.002μf, 600V, 5%	Skottie TXD-4-202-K	1
C2	637-857359	Capacitor, 1.8pf, 500V, 5%	Electromotive DM15-C"1.8"DO-500WV4CR	1
C3	637-832598	Capacitor, 22pf, 500V, 5%	Electromotive DM15-C220J0-500WV4CR	1
C4	637-827575	Capacitor, 18pf, 500V, 5%	Electromotive DM15C-180J0-500WV4CR	1
R1, 7	601-823904	Resistor, 100K, 1/4W, 5%	*A.B. CB1045	2
R2, 3, 8	601-823916	Resistor, 1M, 1/4W, 5%	A.B. CB1055	3
R4	601-823391	Resistor, 150Ω, 1/4W, 5%	A.B. CB1515	1
R5	601-822324	Resistor, 10K, 1/4W, 5%	A.B. CB1035	1
R6	601-823393	Resistor, 270Ω, 1/4W, 5%	A.B. CB2715	1

*"A.B." are Allen Bradley, fixed composition, resistors.



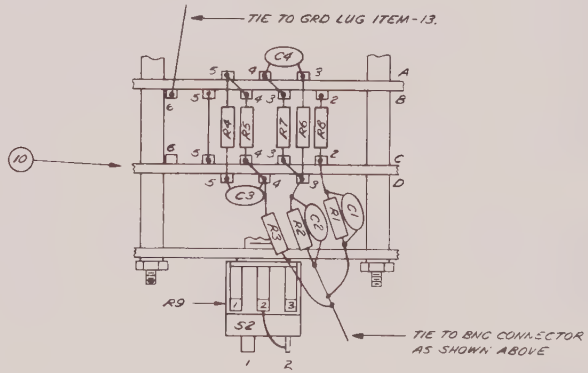
DETAIL A

TYP. FOR A7 & A8

DETAIL B

TYP. FOR A7 & A8

SCALE: 2:1



ITEM	PART NO	DESCRIPTION	QTY
1	A037-437129	PARTS LIST, MECH & WIRED ASSY, F. PANEL	REF

DB55-437142	6401		
NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED

TOLERANCES

X ± .030 ANGULAR ± 0° 30'

XX ± .010

XXX ± .005 MACH SURF ✓

THREADS CLASS 2A OR 2B

REMOVE BURRS & SHARP EDGES .020 MAX

MACH FILLET RADIUS .020 R MAX

MACH SURF FLAT WITHIN .001 IN IN

OTHER SURF FLAT WITHIN .005 IN IN

CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF DIA TOLS .001 MIN

DO NOT SCALE DRAWING

	BY	DATE
DRAWN	K. Shimojo	10 69
CHKD		
ENGR		
APPD		
APPD		

TITLE: MECH & WIRED ASSY, FRONT PANEL

MATERIAL

FINISH

SCALE 1:1

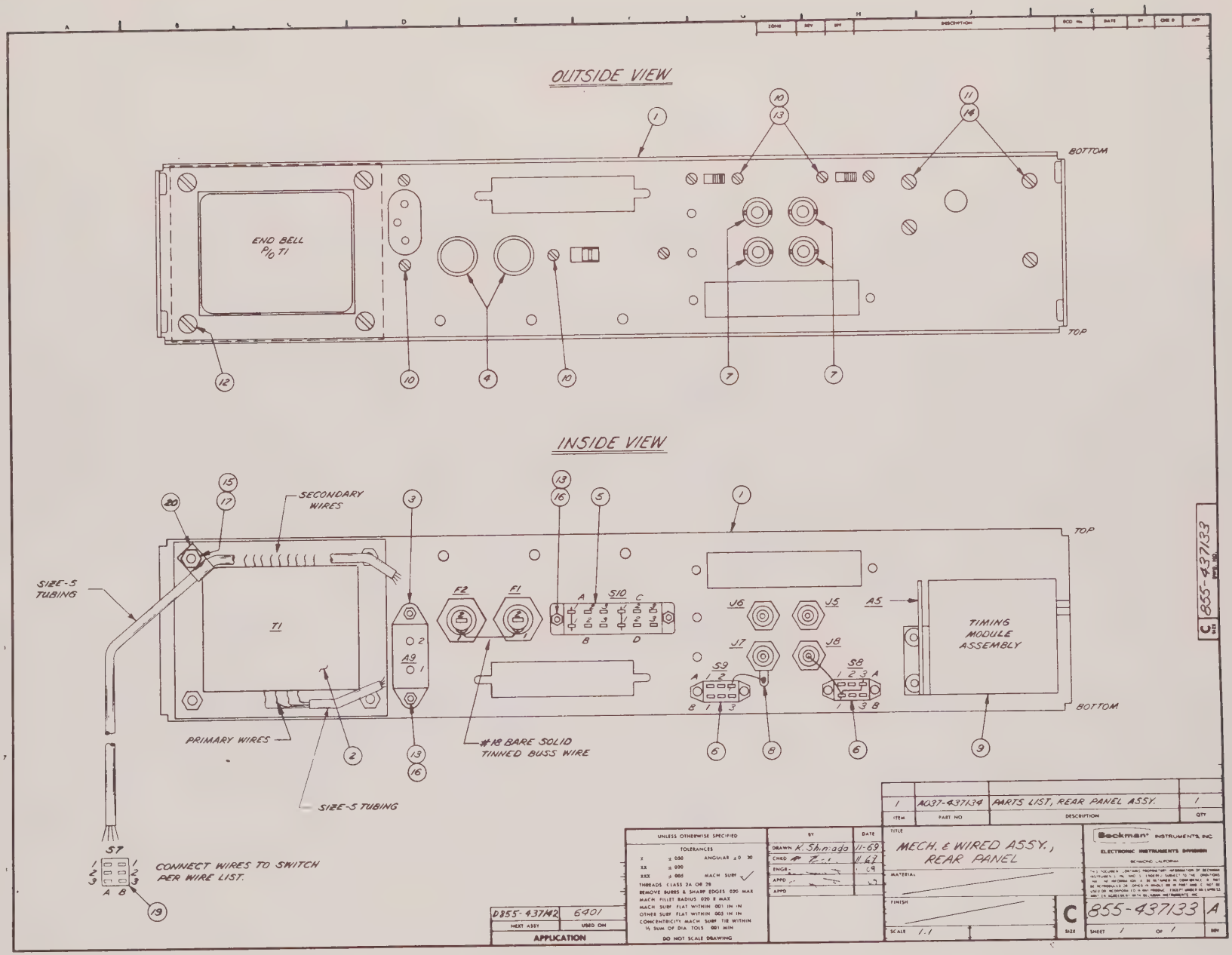
SIZE C

Beckman® INSTRUMENTS, INC. ELECTRONIC INSTRUMENTS DIVISION

DB55-437126 A

SHEET 1 OF 1

C 855-437126


OUTSIDE VIEW
END BELL P/O T1
BOTTOM
TOP
INSIDE VIEW
SECONDARY WIRES
SIZE-5 TUBING
T1
A9
F2
F1
S10
J6
J5
A5
J7
J8
S9
S8
TIMING MODULE ASSEMBLY
TOP
BOTTOM
PRIMARY WIRES
#18 BARE SOLID TINNED BUSS WIRE
SIZE-5 TUBING
S7
CONNECT WIRES TO SWITCH PER WIRE LIST.
855-437133
A037-437134
PARTS LIST, REAR PANEL ASSY.
MECH. & WIRED ASSY., REAR PANEL
Beckman INSTRUMENTS, INC
ELECTRONIC INSTRUMENTS DIVISION
855-437133 A
D855-437142
6401
APPLICATION
DO NOT SCALE DRAWING

FRONT PANEL MECHANICAL & WIRED ASSEMBLY - PARTS LIST

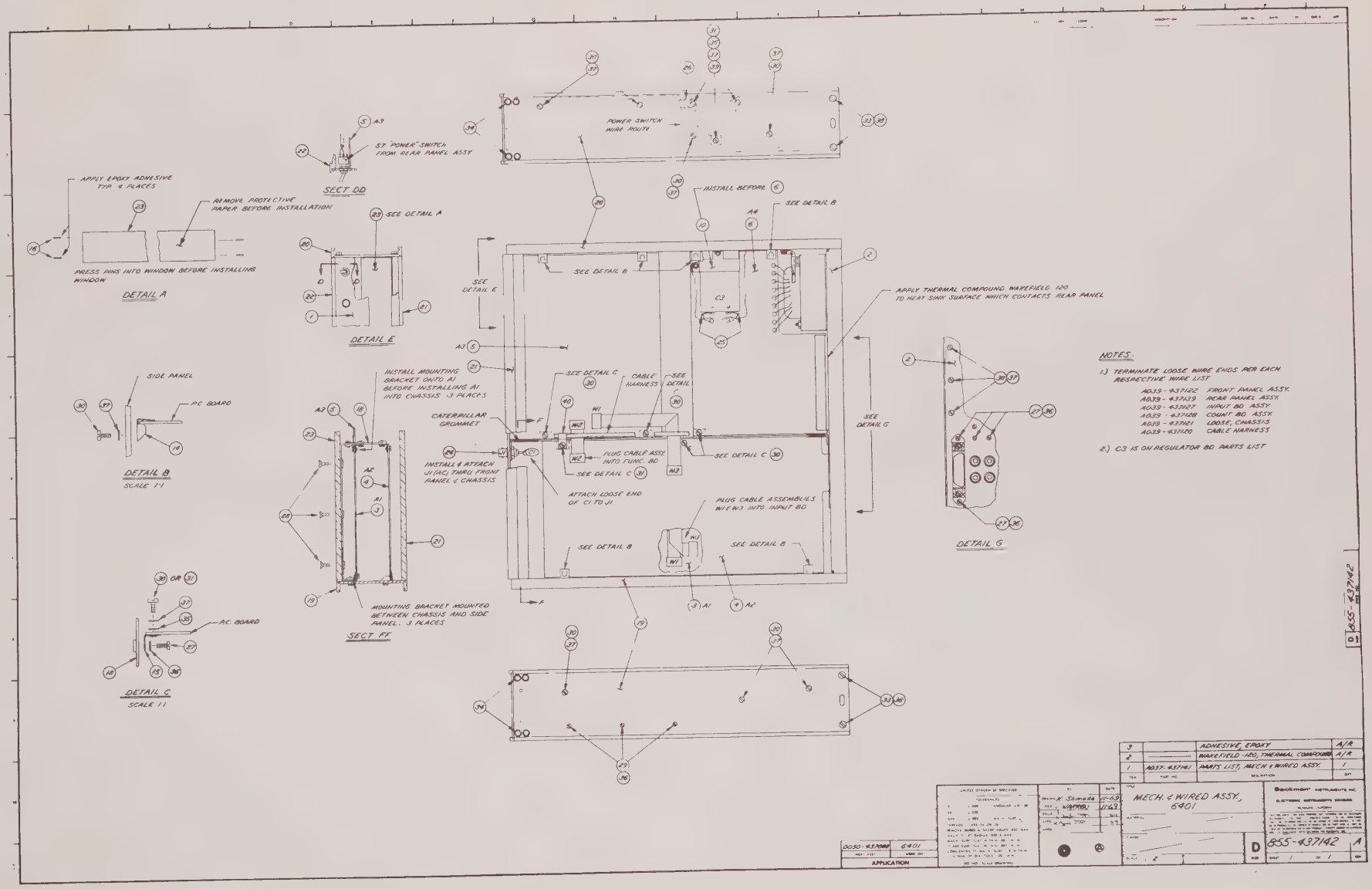
Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	C-437126-A	Front Panel Mechanical & Wired Assy.	Beckman	
A7,8	855-437130	Attenuator Switch Assembly	Beckman	2
C1,2	633-857572	Capacitor, 0.05μf, 1KV, +100 -0%	Aerovox GPDZ5V503P	2
DS10,11	824-846836	Lamp, Neon, Red	Eldema CG03-RCS-N12C	2
DS12,13	824-435662	Lamp Assembly	Beckman	2
J2,3,4	670-854373	Connector, BNC	Kings KC-79-35	3
R1	614-857570	Potentiometer, 500K, 1/4W, Linear	Mallory MLCN55L	1
S1,2	711-437033	Switch, Rotary	Beckman	2
S3,4	701-857324	Switch, SPDT, Toggle, w/Dress Nut	C & K 7101	2
S5	701-829909	Switch, DP3T, Toggle, w/Dress Nut	C & K 7203	1
S6	704-813496	Switch, SPDT, Pushbutton	Switchcraft 913	1
	132-824977	Clip, Lamp Mounting (use w/DS10,11)	Eldema 081-10905	2
	662-437131	Cable Harness	Beckman	1

REAR PANEL MECHANICAL & WIRED ASSEMBLY - PARTS LIST

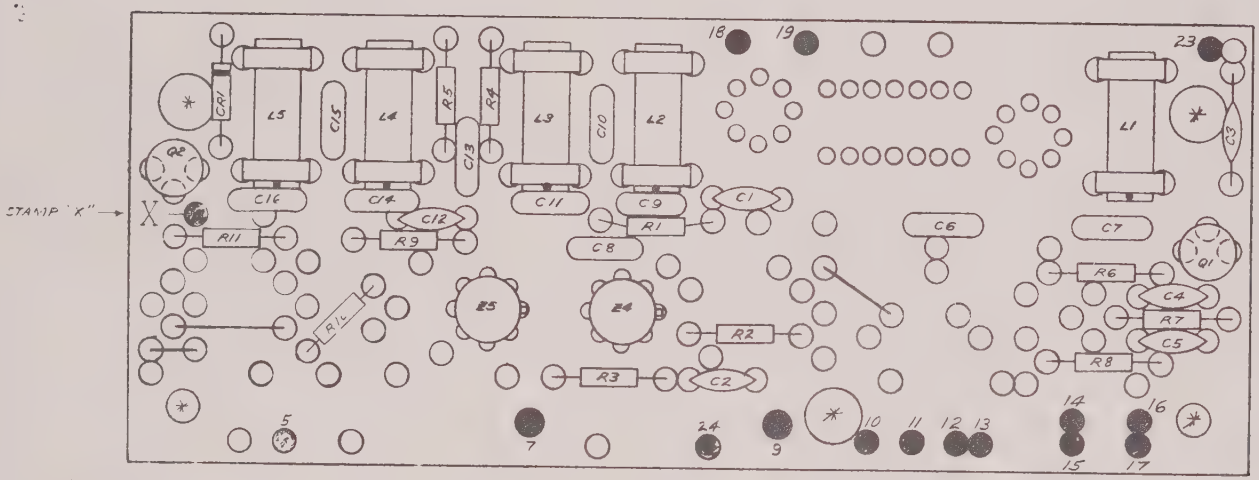
	C-437133-A	Rear Panel Mechanical & Wired Assy.	Beckman	
A5	855-437135	Timing Module Assembly	Beckman	1
A9	771-857281	Line Filter/Receptacle	Sprague JN10-1569A	1
J5,6,7,8	670-854373	Connector, BNC	Kings KC-79-35	4
S7	701-857323	Switch, DPDT, Toggle, w/Dress Nut	C & K 7201	1
S8,9	716-827410	Switch, Slide	Continental Wirt 126	2
S10	716-857542	Switch, Slide, 115/230	Switchcraft 47227LF	1
T1	792-437140	Transformer, Power, w/Cap.	Beckman	1
XF1,2	735-007268	Fuse Post	Bussman HKP	2

MECHANICAL & WIRED ASSEMBLY - PARTS LIST

	D-437142-A	Mechanical & Wired Assembly	Beckman	
A1	855-437037	Input Board Assembly	Beckman	1
A2	855-437117	Function Board Assembly	Beckman	1
A3	855-437063	Count Board Assembly	Beckman	1
A4	855-437096	Regulator Board Assembly	Beckman	1
A6	855-437068	BCD Data Board Assembly	Beckman	1
F2	731-092114	Fuse, 1/2A, Slo-Blo	Littelfuse 312	1
J1	670-854373	Connector, BNC	Kings KC-79-35	1
J10	672-814649	Connector, 50 Position (for BCD Data Board Assembly)	Amphenol 57-40500	1
	325-816804	Knob, 1/8" Mtg., w/Dot	Raytheon	3
	325-840017	Knob, 1/4" Mtg., w/Cap	Raytheon 257	2
	325-857549	Knob, 1/4" Mtg., Concentric	Raytheon 70 Series	2
	313-516291	Foot	Beckman	4
	327-516292	Support Mount (Tilt Foot Bail)	Beckman	1
	664-853435	Line Cord, Detachable	Belden 17258	1
	330-516285	Handle	Beckman	2
	330-526309	Handle, Grip	Beckman	2
	338-813038	Capacitor Mtg. Clamp	Mallory VR-8	1
	783-807862	Ferrite Bead	Ferroxcube 56-590-65/3B	2


POWER SWITCH WIRE ROUTE
S7 POWER SWITCH FROM REAR PANEL ASSY
SECT DD
APPLY EPOXY ADHESIVE TYP 4 PLACES
REMOVE PROTECTIVE PAPER BEFORE INSTALLATION
PRESS PINS INTO WINDOW BEFORE INSTALLING WINDOW
DETAIL A
SEE DETAIL A
DETAIL E
SEE DETAIL E
INSTALL BEFORE 6
SEE DETAIL B
APPLY THERMAL COMPOUND WAKEFIELD 120 TO HEAT SINK SURFACE WHICH CONTACTS REAR PANEL
SEE DETAIL C
CABLE HARNESS
SEE DETAIL
CATERPILLAR GROMMET
PLUG CABLE ASSY INTO FUNC. BD
INSTALL & ATTACH J1 (AC) THRU FRONT PANEL & CHASSIS
ATTACH LOOSE END OF C1 TO J1
PLUG CABLE ASSEMBLIES W1 & W3 INTO INPUT BD
SEE DETAIL G
DETAIL G
SIDE PANEL
P.C. BOARD
DETAIL B
SCALE 1:1
INSTALL MOUNTING BRACKET ONTO A1 BEFORE INSTALLING A1 INTO CHASSIS 3 PLACES
MOUNTING BRACKET MOUNTED BETWEEN CHASSIS AND SIDE PANEL. 3 PLACES
SECT FF
A.C. BOARD
DETAIL C
SCALE 1:1
NOTES:
1.) TERMINATE LOOSE WIRE ENDS PER EACH RESPECTIVE WIRE LIST
A039-437122 FRONT PANEL ASSY.
A039-437139 REAR PANEL ASSY.
A039-437127 INPUT BD ASSY.
A039-437128 COUNT BD ASSY.
A039-437121 LOOSE, CHASSIS
A039-437120 CABLE HARNESS
2.) C3 IS ON REGULATOR BD PARTS LIST
3 ADHESIVE, EPOXY A/R
2 WAKEFIELD - 120, THERMAL COMPOUND A/R
1 A037-437141 PARTS LIST, MECH & WIRED ASSY. 1
MECH. & WIRED ASSY., 6401
D 855-437142 A
0050-437088 6401
APPLICATION

ITEM	QTY	BY	DESCRIPTION	CHG NO	DATE	APP	CHK'D	QTY
	A		DRAWN FROM C055-435660	—	10-69			



NOTES

1. JUMPERS ARE NO. 22AWG BARE SOLID TINNEDWIRE
2. INSERT WIRES, PER WIRE LIST AC35-437147, IN HOLES NOTED ● BEFORE SOLDER OPERATION.
3. ● DENOTES RED DOT ON INDUCTORS

ITEM	PART NO	DESCRIPTION	QTY
2	A035-437145	PARTS LIST	1
1	C022-437137	LOGIC DIAGRAM	REF.

TITLE: BOARD ASSEMBLY, MULTIPLIER

	BY	DATE
DRAWN	K.S.	10-69
CHKD		
ENGR		
APPD		
APPD		

UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ±.030 ANGULAR ±0° 30'
XX ±.010
XXX ±.005 MACH SURF ✓
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES .020 MAX
MACH FILLET RADIUS .030 R MAX
MACH SURF FLAT WITHIN .004 IN/IN
OTHER SURF FLAT WITHIN .010 IN/IN
CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF DIA. TOLS. .001 MAX
DO NOT SCALE DRAWING

MATERIAL	FINISH	SCALE	SIZE	DRAWING NO	REV
		3:1	C	055-437136	A

NEXT ASSY	USED ON
A855-437135	6401

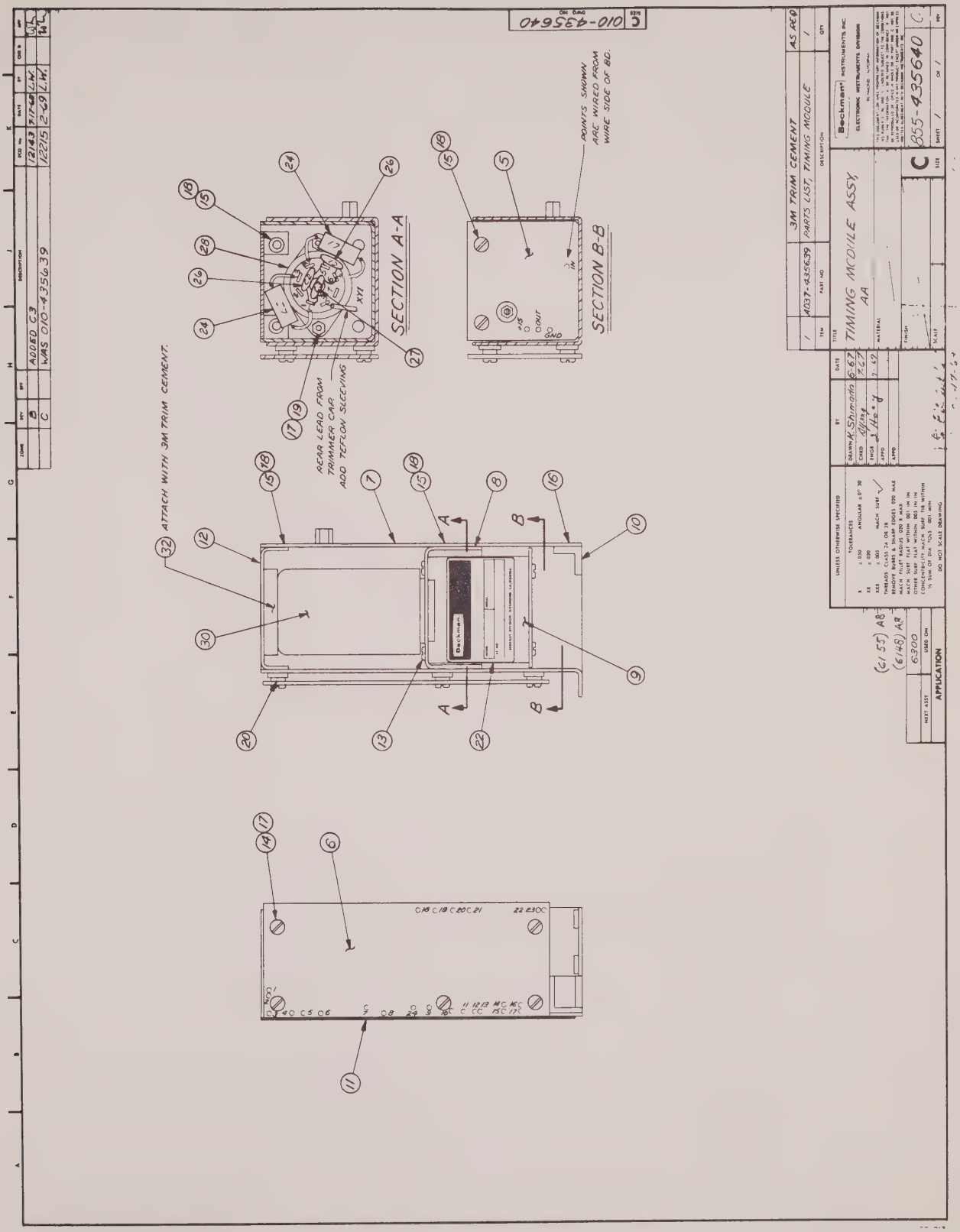
APPLICATION

MULTIPLIER ASSEMBLY - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	C855-437136-A	Multiplier Assembly	Beckman	
C1, 2, 4, 5, 12	633-836864	Capacitor, F. Cerm., 0.01μf, 50V, -20 +80%	Sprague C023B101-F103M	5
C3	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	Aerovox BCD-D1-5-Z5U-103Z	1
C6	637-825335	Capacitor, F. Mica, 39pf, 500V, 5%	*DM15E390J0-500WV4CR	1
C7	637-822250	Capacitor, F. Mica, 620pf, 300V, 5%	DM15F621J0-300WV4CR	1
C8	637-825348	Capacitor, F. Mica, 300pf, 500V, 5%	DM15F301J0-500WV4CR	1
C9, 11	637-825104	Capacitor, F. Mica, 150pf, 500V, 5%	DM15F151J0-500WV4CR	2
C10	637-822769	Capacitor, F. Mica, 24pf, 500V, 5%	DM15C240J0-500WV4CR	1
C13	637-822909	Capacitor, F. Mica, 470pf, 500V, 5%	DM15F471J0-500WV4CR	1
C14, 16	637-822251	Capacitor, F. Mica, 100pf, 500V, 5%	DM15F101J0-500WV4CR	2
C15	637-825227	Capacitor, F. Mica, 5pf, 500V, 10%	DM15C050D0-500WV5CR	1
CR1	755-838731	Diode, 1N4448	Continental Devices	1
L1	795-435581	Inductor, Var., RF, Nom. 40-50μH	Beckman	1
L2, 3	795-435582	Inductor, Var., RF, Nom. 6μH	Beckman	2
L4, 5	795-435583	Inductor, Var., RF, Nom. 2-3μH	Beckman	2
Q1, 2	755-857274	Transistor, 2N4275	Fairchild	2
R1	601-822326	Resistor, 1.2K, 1/4W, 5%	**A. B. CB1225	1
R2	601-822299	Resistor, 6.8K, 1/4W, 5%	A. B. CB6825	1
R3	601-823383	Resistor, 22Ω, 1/4W, 5%	A. B. CB2205	1
R4	601-817735	Resistor, 100Ω, 1/4W, 5%	A. B. CB1015	1
R5	601-823394	Resistor, 330Ω, 1/4W, 5%	A. B. CB3315	1
R6, 8	601-822375	Resistor, 82Ω, 1/4W, 5%	A. B. CB8205	2
R7	601-823391	Resistor, 150Ω, 1/4W, 5%	A. B. CB1515	1
R9	601-823387	Resistor, 47Ω, 1/4W, 5%	A. B. CB4705	1
R10	601-822295	Resistor, 2.7K, 1/4W, 5%	A. B. CB2725	1
R11	601-823396	Resistor, 560Ω, 1/4W, 5%	A. B. CB5615	1
Z4, 5	885-857434	I. C., Dual 2 Input Gate	Fairchild 91429	2

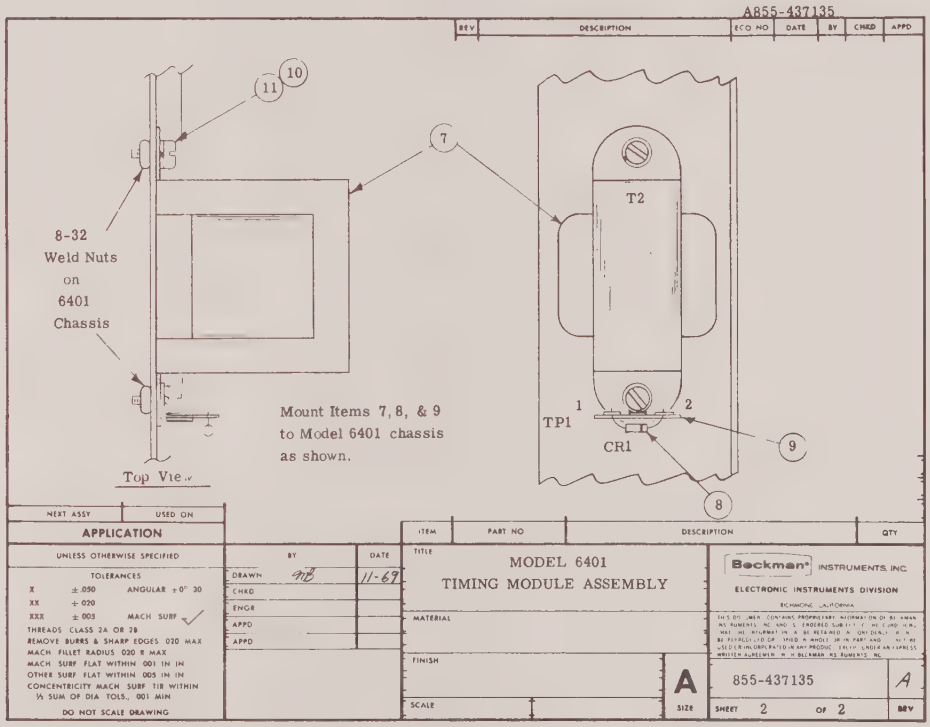
* "DM15...." are Electromotive capacitors.

** "A. B." are Allen Bradley, fixed composition, resistors.


SECTION A-A
SECTION B-B
ATTACH WITH 3M TRIM CEMENT.
REAR LEAD FROM TRIMMER CAP ADD TEFLON SLEEVING
POINTS SHOWN ARE WIRED FROM WIRE SIDE OF BD.
3M TRIM CEMENT
PARTS LIST, TIMING MODULE
4037-435639
TIMING MODULE ASSY
AA
855-435640
Beckman INSTRUMENTS, INC.
ELECTRONIC INSTRUMENTS DIVISION
ADDED C3
WAS 010-435639
APPLICATION
USED ON
6300

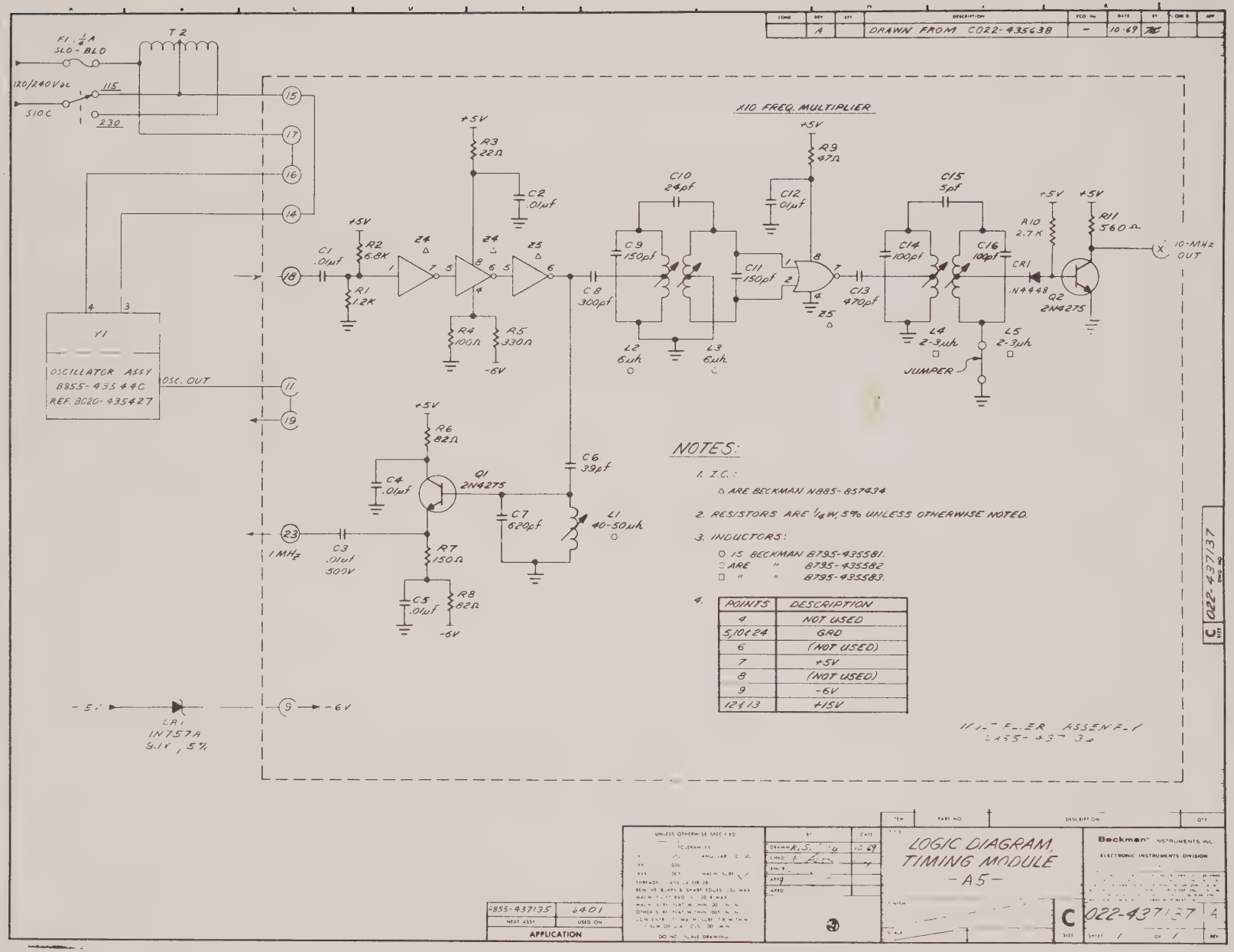
AA TIMING MODULE ASSEMBLY - PARTS LIST

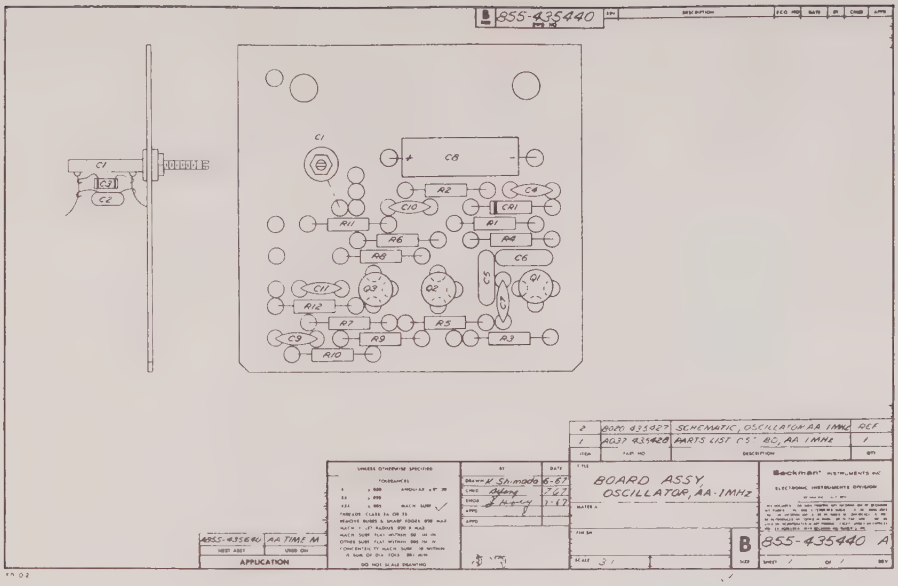
Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	C-435640-C	AA Timing Module Assembly	Beckman	
C1, 2	633-804706	Capacitor, F. Cerm., 0.001μf, 20%, 1000WVDC	Centralab DD-102	2
C3	633-829336	Capacitor, F. Cerm., 0.1μf, 500V	Sprague 41C92	1
L1, 2	795-807919	Inductor, 470μH	Delevan 3500-24	2
XY1	860-042963	Socket, Octal	Cinch 101-24-10-067	1
Y1	881-430340	Crystal, 1 MHz	Beckman	1



TIMING MODULE ASSEMBLY - PARTS LIST

	A-437135-A	Timing Module Assembly	Beckman	
CR1	755-822923	Diode, Zener, 9.1V, 1N757A	Texas Instruments	1
F1	731-015101	Fuse, 1/4A, Slo-Blo	Bussman MDL	1
T2	792-857559	Auto. Transformer	Knight "Allied" 54F2555	1
TP1	691-000506	Terminal Strip	Cinch Jones 332-11-03-028	1

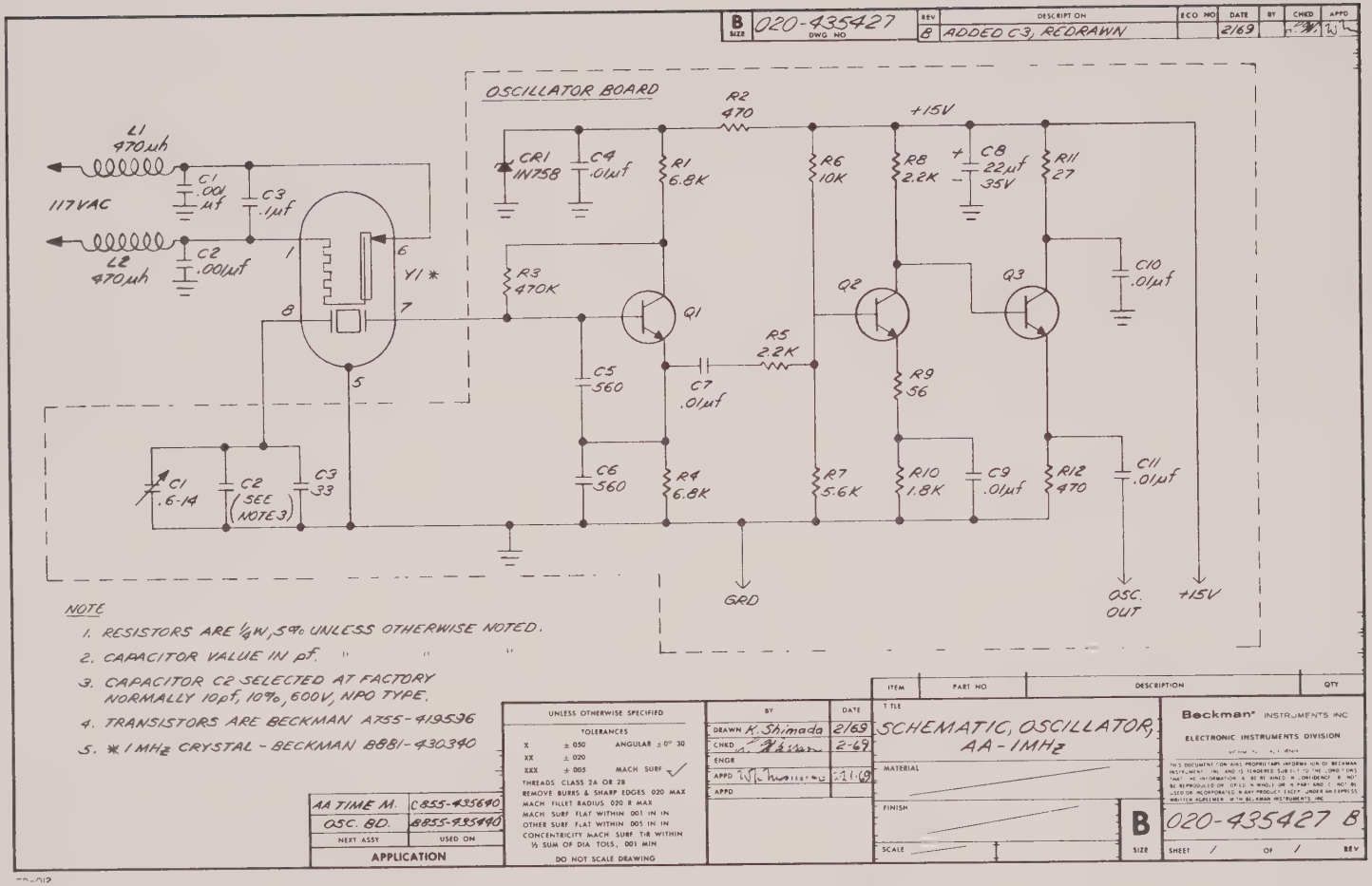

X10 FREQ. MULTIPLIER
+5V
F1 1/8A SLO-BLO
T2
120/240V ac
S10C
115
230
OSCILLATOR ASSY
B855-435440
REF. B020-435427
Y1
OSC. OUT
1 MHz
C3 .01uf 500V
R1 1.2K
R2 6.8K
C1 .01uf
R3 22Ω
C2 .01uf
R4 100Ω
R5 330Ω
-6V
C8 300pf
C9 150pf
C10 24pf
C11 150pf
L2 6uh
L3 6uh
R9 47Ω
C12 .01uf
C13 470pf
C14 100pf
C15 5pf
C16 100pf
L4 2-3uh
L5 2-3uh
JUMPER
R10 2.7K
R11 560Ω
CR1 1N4448
Q2 2N4275
10-MHz OUT
R6 82Ω
C4 .01uf
Q1 2N4275
C6 39pf
C7 620pf
L1 40-50uh
R7 150Ω
C5 .01uf
R8 82Ω
-5.1
CR1 IN757A 9.1V, 5%
-6V
NOTES:
1. I.C.:
△ ARE BECKMAN N885-857434
2. RESISTORS ARE 1/4W, 5% UNLESS OTHERWISE NOTED.
3. INDUCTORS:
○ IS BECKMAN B795-435581.
△ ARE " B795-435582
□ " " B795-435583.
4.
POINTS | DESCRIPTION
4 | NOT USED
5,10&24 | GRD
6 | (NOT USED)
7 | +5V
8 | (NOT USED)
9 | -6V
12&13 | +15V
INTERFACER ASSEMBLY 435-4330
DRAWN FROM C022-435638
LOGIC DIAGRAM, TIMING MODULE -A5-
Beckman INSTRUMENTS INC
ELECTRONIC INSTRUMENTS DIVISION
C022-437137
APPLICATION
6401
B855-437135



AA - 1 MHz OSCILLATOR BOARD ASSEMBLY - PARTS LIST

Detail No.	Beckman Part No.	Description	Typical Manufacturer & No.	Qty./ Assy.
	B-435440-A	AA-1MHz Oscillator Board Assembly	Beckman	
C1	655-824658	Capacitor, V, 6-14pf	JFD Electric VC11-GRA-DL	1
C2	637-xxxxxx	Capacitor, Factory Selected Value		1
C3	633-804671	Capacitor, F. Cerm., 33pf, 600V, 5%	Aerovox TCS12-NPO-330J	1
C4, 7, 9, 10, 11	633-836864	Capacitor, F. Cerm., 0.01μf, 50V, -20 +80%	Sprague C023B101F-103M	5
C5, 6	637-825349	Capacitor, F. Mica, 560pf, 300V, 5%	Electromotive DM15-F561J0-300WV4CR	2
C8	631-814054	Capacitor, F. Tant. 22μf, 35V, ±20%	Components Inc. TS3K-35-226	1
CR1	755-809734	Diode, Zener, 1N758	Texas Instruments	1
Q1, 2, 3	755-419596	Transistor, Special	Beckman	3
R1, 4	601-822299	Resistor, 6.8K, 1/4W, 5%	*A. B. CB6825	2
R2, 12	601-823395	Resistor, 470Ω, 1/4W, 5%	A. B. CB4715	2
R3	601-823912	Resistor, 470K, 1/4W, 5%	A. B. CB4745	1
R5, 8	601-822328	Resistor, 2.2K, 1/4W, 5%	A. B. CB2225	2
R6	601-822324	Resistor, 10K, 1/4W, 5%	A. B. CB1035	1
R7	601-823397	Resistor, 5.6K, 1/4W, 5%	A. B. CB5625	1
R9	601-823388	Resistor, 56Ω, 1/4W, 5%	A. B. CB5605	1
R10	601-822544	Resistor, 1.8K, 1/4W, 5%	A. B. CB1825	1
R11	601-823384	Resistor, 27Ω, 1/4W, 5%	A. B. CB2705	1

*"A. B." are Allen Bradley, fixed composition resistors.


B SIZE 020-435427 DWG NO
REV DESCRIPT ON ECO NO DATE BY CHKD APPD
B ADDED C3, REDRAWN 2/69
OSCILLATOR BOARD
L1 470μh
L2 470μh
117VAC
C1 .001 μf
C2 .001μf
C3 .1μf
Y1 *
CR1 IN758
C4 .01μf
R1 6.8K
R2 470
R3 470K
R4 6.8K
R5 2.2K
R6 10K
R7 5.6K
R8 2.2K
R9 56
R10 1.8K
R11 27
R12 470
C5 560
C6 560
C7 .01μf
C8 22μf 35V
C9 .01μf
C10 .01μf
C11 .01μf
Q1
Q2
Q3
+15V
GRD
OSC. OUT
C1 .6-14
C2 (SEE NOTE 3)
C3 33
NOTE
1. RESISTORS ARE ¼W, 5% UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUE IN pf.
3. CAPACITOR C2 SELECTED AT FACTORY NORMALLY 10pf, 10%, 600V, NPO TYPE.
4. TRANSISTORS ARE BECKMAN A755-419596
5. * 1 MHz CRYSTAL - BECKMAN 8881-430340
ITEM PART NO DESCRIPTION QTY
UNLESS OTHERWISE SPECIFIED
TOLERANCES
X ± 050 ANGULAR ± 0° 30
XX ± 020
XXX ± 005 MACH SURF ✓
THREADS CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES 020 MAX
MACH FILLET RADIUS 020 R MAX
MACH SURF FLAT WITHIN 001 IN IN
OTHER SURF FLAT WITHIN 005 IN IN
CONCENTRICITY MACH SURF TIR WITHIN ½ SUM OF DIA TOLS, 001 MIN
DO NOT SCALE DRAWING
BY DATE
DRAWN K. Shimada 2/69
CHKD 2-69
ENGR
APPD
APPD 2-21-69
T TLE SCHEMATIC, OSCILLATOR, AA-1MHz
MATERIAL
FINISH
SCALE
B SIZE
Beckman® INSTRUMENTS INC
ELECTRONIC INSTRUMENTS DIVISION
020-435427 B
SHEET 1 OF 1 REV
AA TIME M. C855-435640
OSC. BD. 8855-435440
NEXT ASSY USED ON
APPLICATION

E. I. D. CUSTOMER SERVICE

Beckman's commitment to you begins with the design and development of a product to fill your needs. This commitment continues through manufacturing, delivery, and your application of the finished product.

Your investment in a Beckman product brings the added benefits of Beckman Customer Service, which began operating on your behalf in the research, development, and design of your instrument, and continues serving you through the life of your instrument. Over 32 years of demonstrated product and service performance continues to build customer confidence and satisfaction with Beckman.

Beckman's service commitment to you is in recognition of the stringent and diverse demands which must be met by your instrument or system. The specified performance you purchased must be met every time you need it, when you need it . . . and for as long as you need it.

In a continuing program to bring Beckman service closer to you, we maintain three regional service and repair centers in the United States: Fullerton, California; Schiller Park, Illinois; and Mountainside, New Jersey. To further expand our service capabilities, district service repair centers are in full operation at Huntsville, Alabama; Albuquerque, New Mexico; Boston, Massachusetts; Timonium, Maryland; Houston, Texas; and Detroit, Michigan.

The following pages describe the basic facets of customer service, available to you as a valued Beckman customer:

- *Beckman Warranty*
- *Accurate Technical Information*
- *Useful Technical Training*
- *Installation and On-Site Service*
- *Factory Repair Service*
- *Replacement Parts*
- *Service Contracts*
- *Modifications/Expansions*

Beckman Warranty
Every standard instrument produced by Beckman Instruments, Inc., carries with it a warranty. A statement accompanies each shipment describing our warranty conditions in detail.

Your purchase of a Beckman instrument reflects your confidence in the quality, materials, workmanship, product performance, and responsive service record of Beckman. The Beckman warranty is our expression of confidence and commitment that your instrument will deliver the economy and excellence of use which you expect of each Beckman product.

Technical Literature
Technical data sheets are available to you on every Beckman instrument. You need information which is complete, accurate, useful in your terms, and which truly assists you in making the best decision in product selection. Beckman continues to set industry standards in this area of real benefit to you.

Operating and Service Manuals are supplied with each instrument, to provide theory of operation, operating instruction, maintenance/calibration procedures, and a tabulation of replaceable parts. These manuals are available in quantity . . . even for older instruments which promise to deliver required performance for many more years.

Service and Application Notes cover special maintenance procedures, modifications, or useful calibration techniques. Knowledge of the full scope of instrument applications will optimize your use of Beckman products. Your Beckman Service Representative will be pleased to offer this literature to you upon request.

REPLACEMENT PARTS

Inventories
The response time you must have on instrument maintenance, either in your laboratory or at Beckman, is directly dependent upon immediate access to the required parts inventory. We have placed this stock of replacement parts closer to you by implementing active inventories in each of our three regional service centers across the United States. Check Sections II, III, and IV of this Directory for the service office nearest to your facility.

Parts Identification and Ordering
Every Beckman service office retains complete technical files to help you identify required parts. You will find a tabulation of replacement parts in the manual delivered with your instrument or system. Every one of your Beckman Field Specialists is ready to offer further assistance at any time.

Delivery
A replacement part is a critical item. Your request or order is filled the same day that it is received at the point where the part is stocked. A parts order which cannot be satisfied in five days or less will result in immediate notification to you with a statement of best delivery. You can depend on most parts orders being filled and shipped the day received.

When ordering a supply or replacement item, listing the Beckman stock number and its generic title as shown in your Operating and Service Manual will expedite the handling of your order.

REPAIR SERVICE

Factory Repair Service
Complete factory repair capability is maintained at each of our manufacturing facilities, covering every instrument and system on our product list. Factory Repair Centers for E.I.D. are as follows:

Richmond Products

Beckman Instruments, Inc.
Electronic Instruments Division
2200 Wright Avenue
Richmond, California 94804
Attention: Factory Service Manager

Schiller Park Products

Beckman Instruments, Inc.
Electronic Instruments Division
P.O. Box 66204
Chicago, Illinois 60666
Attention: Factory Service Manager

Fullerton Products

Beckman Instruments, Inc.
Electronic Instruments Division
2400 Harbor Boulevard
Fullerton, California 92634
Attention: Factory Service Manager

Regional Repair Capability
We have established and staffed regional repair centers at Fullerton, California; Schiller Park, Illinois; and Mountainside, New Jersey, to supplement our factory repair service. Complete repair facilities up to major overhaul and refurbishment are maintained at each regional service center. We feel that this type of service will prove to be a genuine benefit and will bring Beckman Service closer to our customers.

On-Site Repair Service

Beckman service specialists are factory-trained and equipped to effect many maintenance or repair actions right where your instrument is located—with *no* disruption to your operating schedules. Your timely use of this service can significantly reduce subsequent repair bills and costly "down time."

Equipment and Personnel Standards

We are directing our entire effort toward a single objective—your satisfaction. Design and equipment excellence must be matched by similar excellence of our personnel working with you. To that end, we sustain a continuous and formal program of equipment, calibration, inspection, and personnel improvement. Your inputs help us to meet our objectives!

BECKMAN TOTAL SERVICE

The Electronic Instruments Division of Beckman Instruments, Inc., currently provides contract service on an annual, fixed-price basis to many customers. These clients have found both time and dollar economies are maximized in their operation when served by a Beckman Service Contract.

Beckman has successfully performed under this formal program for over eight years. Many clients have renewed these contracts year after year because it saved them money while maximizing continuous and efficient performance of their equipment.

With a planned investment in a Beckman *TOTAL SERVICE* Contract, you insure that your instruments are delivering optimum performance at all times. Some of our clients claim to have saved or made more money under a Beckman Service Contract than the original purchase price of the equipment. It's hard to beat that kind of economy.

A BECKMAN *TOTAL SERVICE* AGREEMENT provides:

- *Regular check-ups to insure proper operation.*
- *Coordination with your personnel to solve instrument or system problems.*
- *Refresher training for your operators.*
- *Emergency service consultation or calls.*
- *Parts replacement.*
- *Factory repair.*
- *System or instrument optimization twice a year, where all parts are checked for marginal operation; identification of aging components or sub-assemblies; tests are conducted to establish that the product meets or exceeds its original, as installed, accuracy specification; and a written statement is provided indicating that the product meets or exceeds its original accuracy specification.*

A BECKMAN MAINTENANCE SERVICE CONTRACT provides:

- *Beckman factory-trained field specialist(s) at your facility to conduct required training, maintenance and/or operation of your Beckman equipment.*
- *Services available to meet your requirements include all emergency repair service; on-call 24 hours; all maintenance and calibration; parts expediting and installation; factory repair expediting; modifications and refurbishment assistance; continuous optimization of instrument or system performance; and creating or up-grading software programs.*

Beckman's Service Contract performance is of field-proven benefit to you. Extensive data is available to you which demonstrates direct savings and other performance values. Beckman Service improves the usefulness and efficiency of each instrument or system purchased from Beckman throughout the entire life of the product.

POINTS OF CONTACT

Your Location	For Service, Call or Write:
Maine New Hampshire Vermont Massachusetts Connecticut Rhode Island	Beckman Instruments, Inc. Electronic Instruments Division 599 North Avenue Wakefield, Massachusetts 01880 Phone: (617) 245-6800 Attention: Service Manager
New York New Jersey Maryland Virginia West Virginia Washington, D.C.	Beckman Instruments, Inc. Electronic Instruments Division Route 22, Summit Road Mountainside, New Jersey 07092 Phone: (201) 232-7600 Attention: Service Manager
Tennessee North Carolina South Carolina Mississippi Alabama Georgia Florida	Beckman Instruments, Inc. Electronic Instruments Division 4306 Governors Drive, Suite R Huntsville, Alabama 35805 Phone: (205) 881-2383 Attention: Service Manager
North Dakota South Dakota Minnesota Wisconsin Nebraska Iowa Kansas Missouri Illinois Michigan Indiana Ohio Pennsylvania Kentucky	Beckman Instruments, Inc. Electronic Instruments Division P. O. Box 66204 Chicago, Illinois 60666 Phone: (312) 678-6225 Attention: Service Manager
Oklahoma Arkansas Texas Louisiana	Beckman Instruments, Inc. Electronic Instruments Division 5810 Hillcroft Avenue Houston, Texas 77036 Phone: (713) 781-0810 Attention: Service Manager
Montana Idaho Wyoming Utah Colorado Arizona New Mexico	Beckman Instruments, Inc. Electronic Instruments Division 4200-D Silver Avenue, S.E. Albuquerque, New Mexico 87108 Phone: (505) 265-8511 Attention: Service Manager
Washington Oregon Northern Nevada Northern California	Beckman Instruments, Inc. Electronic Instruments Division 2200 Wright Avenue Richmond, California 94804 Phone: (415) 526-7730 Attention: Service Manager
Southern California Southern Nevada	Beckman Instruments, Inc. Electronic Instruments Division 2400 Harbor Boulevard Fullerton, California 92634 Phone: (213) 691-0841 Attention: Service Manager

"A" BURST ENABLE

STORAG

.1us 13 CR11 R28 10

1us 12 CR12 R29 10

10us 11 CR13 R30 10

.1ms 10 CR14 R31 10

1ms 9 CR15 R32 10

10ms 8 CR16 R33 10

.1S 7 CR17 R34 10

1S 6 CR18 R35 10

10S 5 CR19

FREQ. 23 CR21 15 FREQ.

BURST 24 CR22 14 BURST

COUNT 25 CR23 18 COUNT

HOLD 26 CR24 19 HOLD

TIM 27 CR25 20 TIM

PERIOD 36 CR26 21 PERIOD

PERIOD AVE. 35 CR27 22 PERIOD AVE.

RATIO 34 CR28 23 RATIO

MUTE 19 14

REMOTE 27

START SLOPE 31 CR29 26 START SLOPE

STOP SLOPE 30 CR30 25 STOP SLOPE

INPUT 33 CR31 24 B-INPUT

+5V R36 1K

CR9 CR10

Z17 Z18 Z19 Z20 Z21 Z22 Z23 Z24 Z25 Z26 Z27 Z28 Z29 Z30

CR32 * CR33 * CR34 *

R37

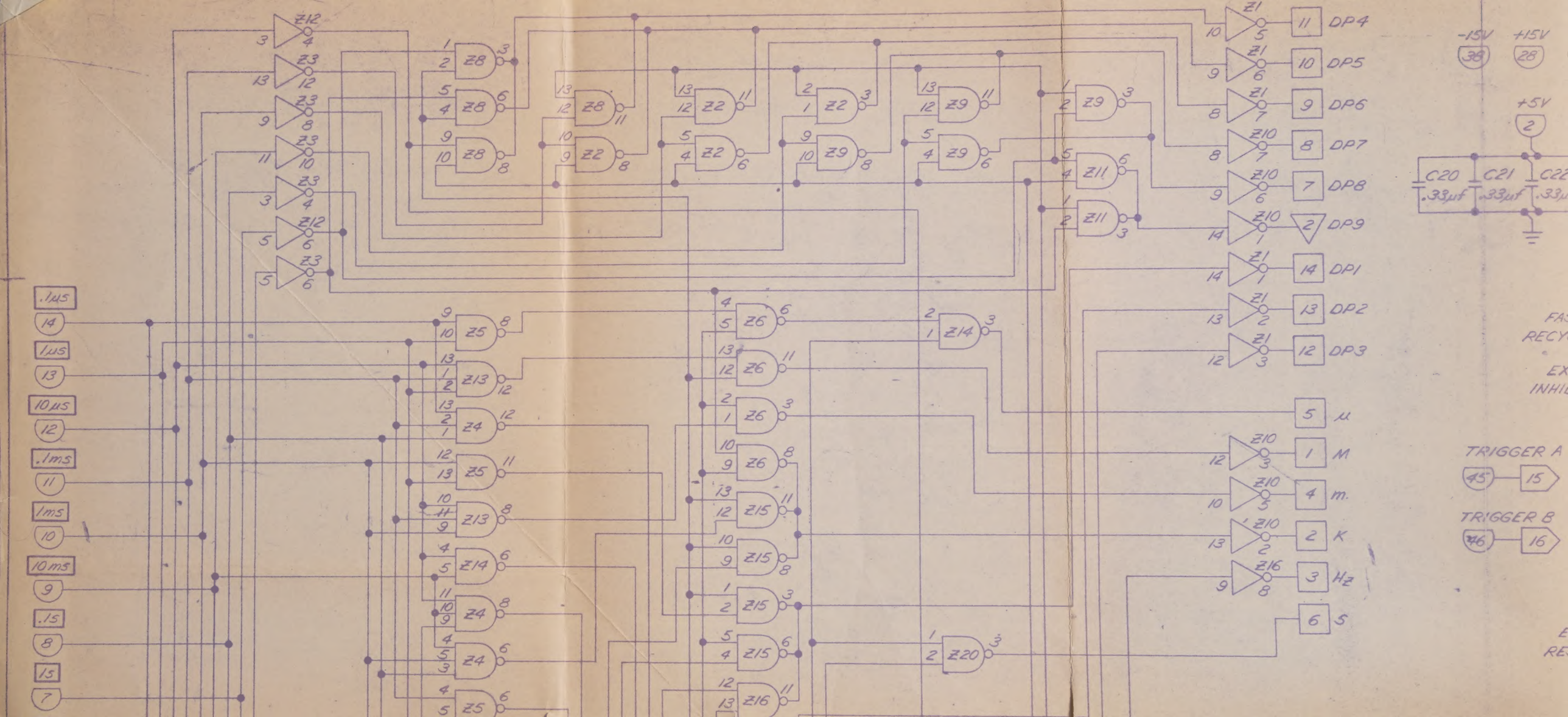
R39 2.7K R38 2.7K R40 2.7K R41 2.7K

Q4 2N3638A Q5 2N 3638A Q7 2N 3638A

-B +B -A +A

GRD 32 33

+5V
R22
1K
Z51
R23
0.5K
Z53
Z54
C11
0.01μf
R25
10K
CR8
-15V
Q3
2N4275
Z54
Z54
Z54
C12
0.01μf
+5V
R42
680
Z41
Z42
Z43
Z44
Z45
Z46
Z47
Z48
CR39
CR40
CR41
CR42
CR43
CR44
CR45
Z37
Z37
Z31
Z38
Z38
Z38
Z38
Z39
Z39
Z39
Z39
Z50
Z49
C14
.02μf
R43
270
Z31
R45
1K
CR36
Z33
Z33
Z32
C15
120pf
R44
270
Z31
Z32
Z32
Z56
Z52
C18
33μf
R53
560
R54
1.5K
+5V
R52
10K
CR46
+15V
R51
2.7K
-15V
Z23
C17
330pf
R49
470
R50
560
Q9
2N4275
Q6
2N3638A
+15V
R48
2.7K
R46
470
Z31
C16
330pf
R47
560
Q8
2N4275
35
B-
LAMP
Z37
Z49
TEST
GATE
GATE
LAMP
DRIVE
29
START
MARKER
30
STOP
MARKER
BOARD NOTES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14
1µs
13
10µs
12
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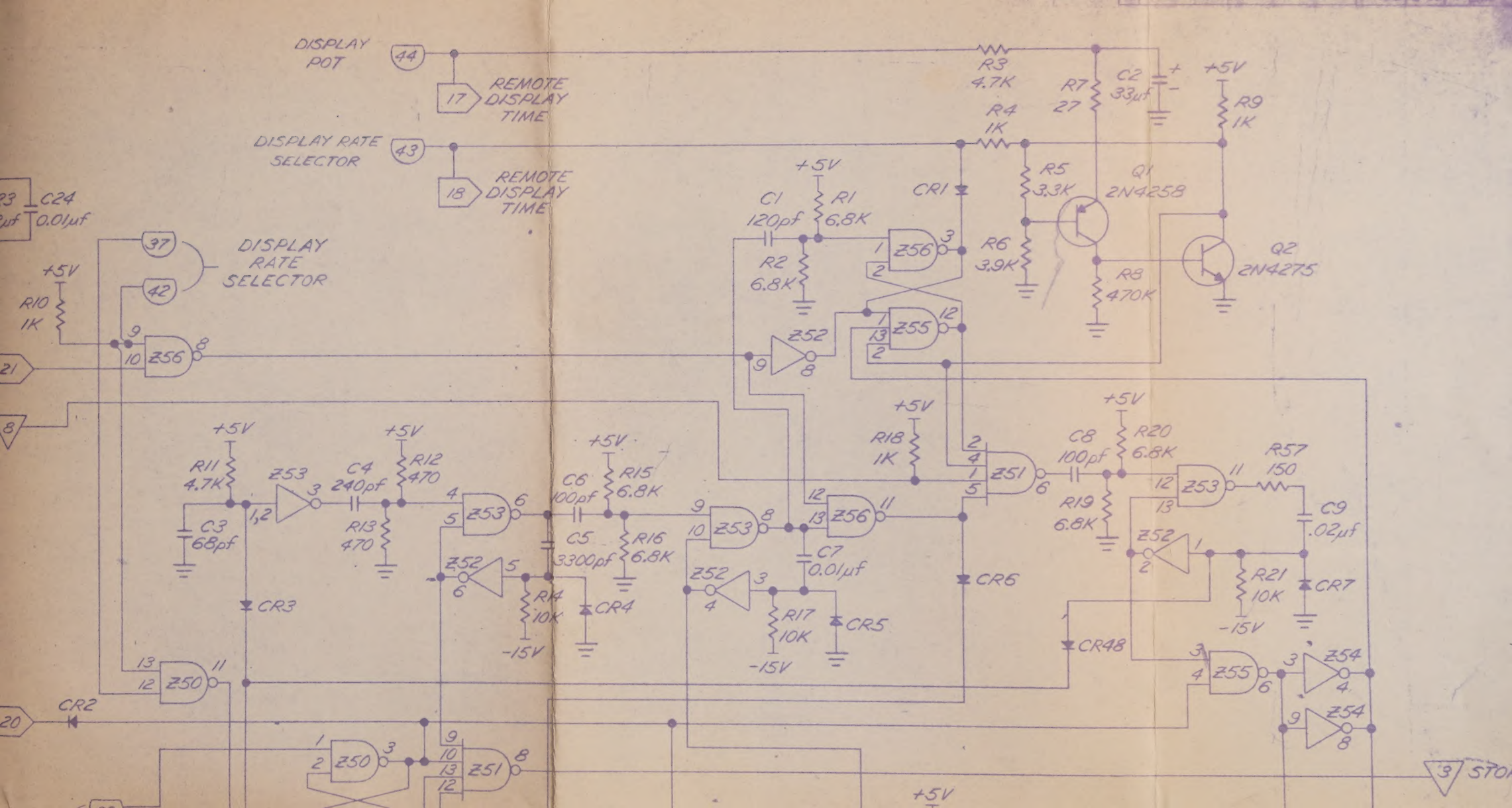
11
1ms
10
10ms
9
.1S
8
1S
7
-15V
38
+15V
28
+5V
2
C20
.33µf
C21
.33µf
C22
.33µ
DP4
DP5
DP6
DP7
DP8
DP9
DP1
DP2
DP3
µ
M
m.
K
Hz
S
TRIGGER A
45
15
TRIGGER B
46
16


DISPLAY POT
44
17
REMOTE DISPLAY TIME
DISPLAY RATE SELECTOR
43
18
REMOTE DISPLAY TIME
R3 4.7K
R4 1K
R7 27
C2 33µf
+5V
R9 1K
R5 3.3K
Q1 2N4258
R6 3.9K
R8 470K
Q2 2N4275
C24 0.01µf
37
42
DISPLAY RATE SELECTOR
+5V
R10 1K
21
8
C1 120pf
R1 6.8K
R2 6.8K
CR1
Z56
Z55
Z52
+5V
R11 4.7K
Z53
C4 240pf
R12 470
R13 470
C3 68pf
CR3
Z52
R14 10K
-15V
CR4
C6 100pf
R15 6.8K
C5 3300pf
R16 6.8K
Z53
Z52
R17 10K
-15V
CR5
C7 0.01µf
CR6
+5V
R18 1K
Z51
C8 100pf
R20 6.8K
R19 6.8K
Z53
R57 150
C9 .02µf
Z52
R21 10K
-15V
CR7
CR48
Z55
Z54
Z54
20
CR2
Z50
Z50
Z51
+5V
3
STO

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1020151